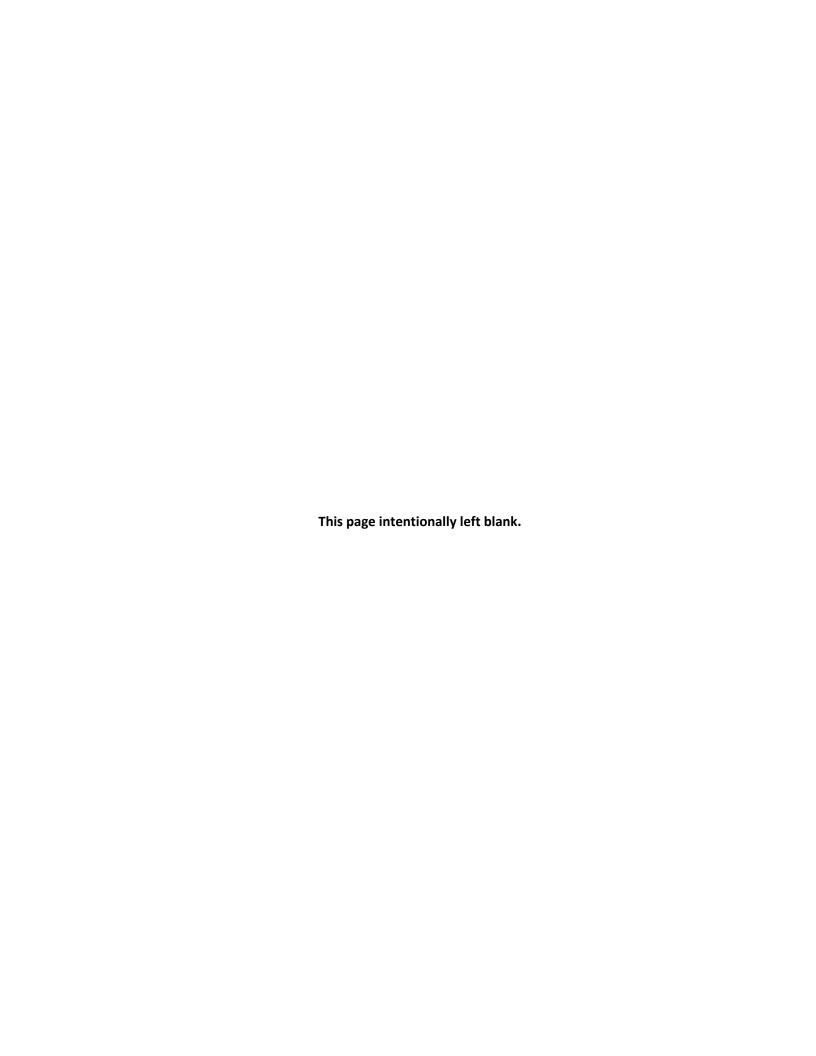
Environmental Impact Statement for Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory, Ventura County, California

Prepared for

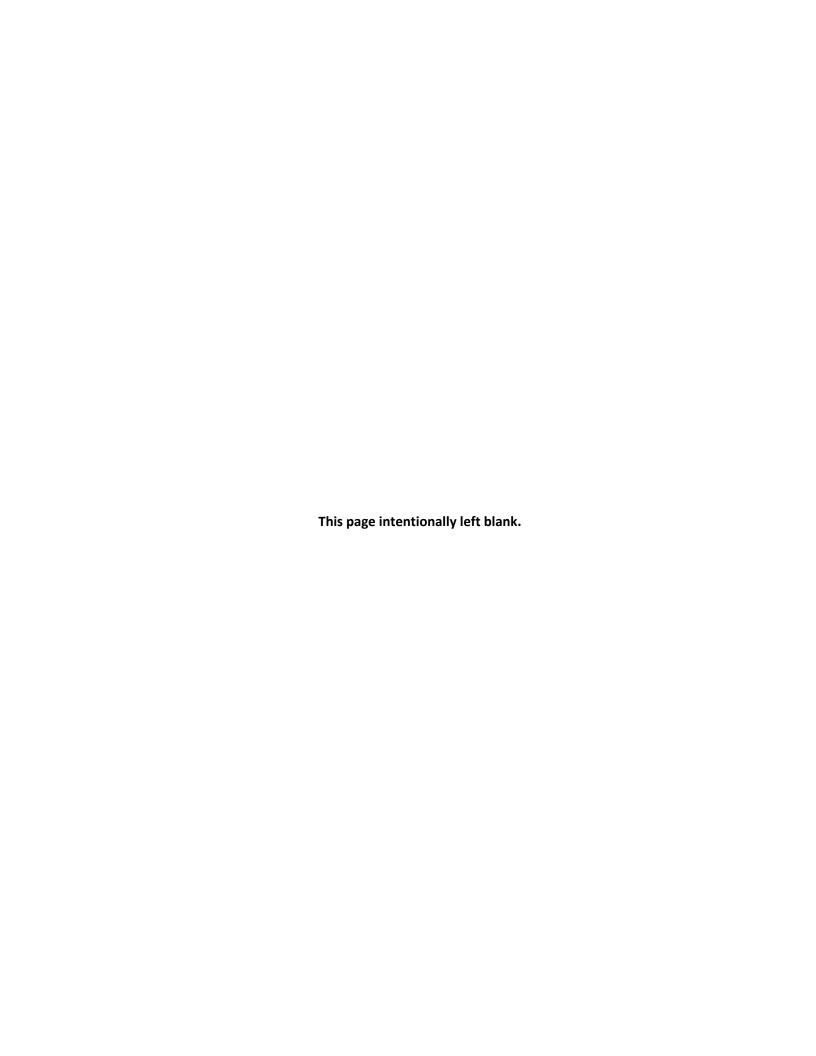
National Aeronautics and Space Administration

March 2014



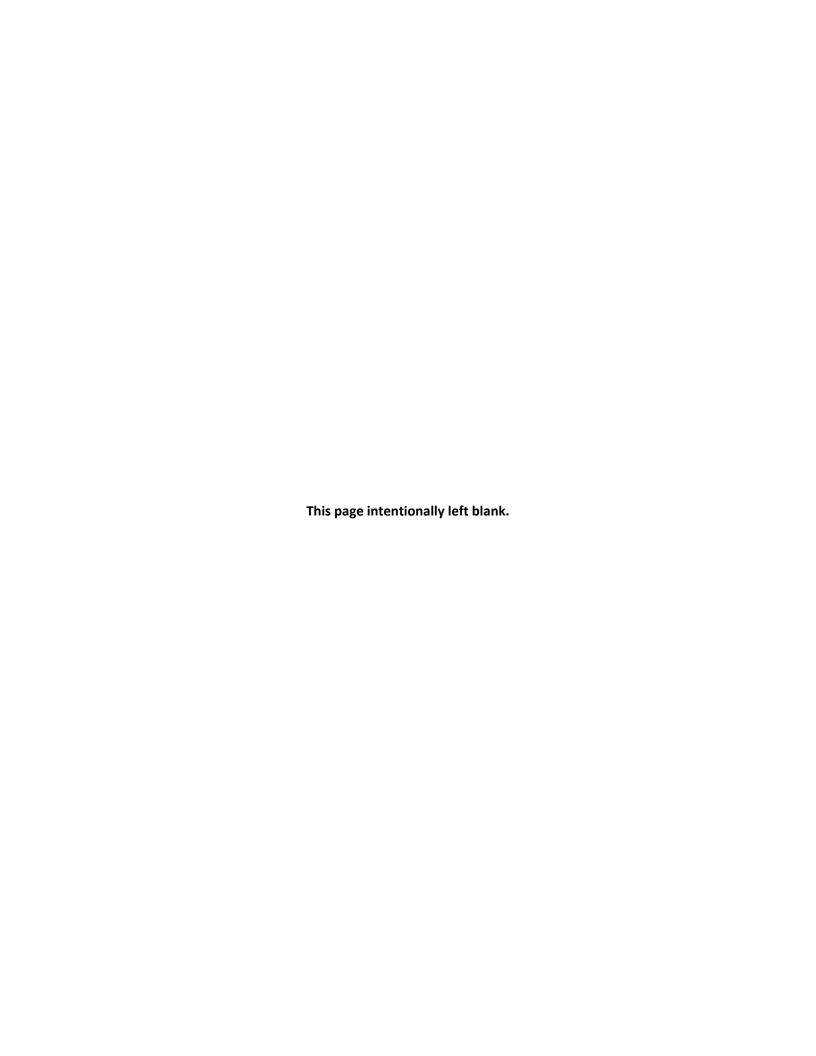
Contents

Appendix A	Council on Environmental Quality June 19, 2012, Letter
Appendix B	Applicable Laws and Regulations
Appendix C	Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field
	Laboratory, NASA Areas I and II, Ventura County, California
Appendix D	Fall 2010 Habitat and Listed Species Surveys of NASA-administered Property at Santa
	Susana Field Laboratory
Appendix E	2011 Supplemental Biological Surveys of NASA-administered Property at Santa Susana
	Field Laboratory
Appendix F	Quino Checkerspot Butterfly Habitat Survey for NASA-administered Property at Santa
	Susana Field Laboratory



APPENDIX A

Council on Environmental Quality Letter, June 19, 2012





EXECUTIVE OFFICE OF THE PRESIDENT COUNCIL ON ENVIRONMENTAL QUALITY

WASHINGTON, D.C. 20503

June 19, 2012

The Honorable Barbara Boxer Chairman Committee on Environment and Public Works United States Senate Washington, D.C. 20510-6175

Dear Chairman Boxer:

Thank you for your May 2, 2012 letter inquiring about the alternatives that the National Aeronautics and Space Administration (NASA) must consider for the cleanup of the Santa Susana Field Laboratory Site under the National Environmental Policy Act (NEPA) based on the existing Administrative Order on Consent, signed on December 6, 2010 (the Agreement). Your letter also asks for the views of the Council on Environmental Quality (CEQ) on how NASA and the State of California (State) can cooperate and move forward with the cleanup process. In the specific situation of NASA's cleanup of the Santa Susana site, NASA has committed under the Agreement to perform a cleanup of chemical and/or radiological contaminants in or on soils at the site to local background levels. NASA's current range of alternatives includes various other cleanup standards that do not clean up to background.

NEPA anticipates full disclosure to the public and the decision maker of the environmental effects of a project and its reasonable alternatives before a decision is made. CEQ oversees implementation of NEPA, principally through issuance and interpretation of NEPA regulations that implement the requirements of NEPA. The Supreme Court has long recognized that CEQ's interpretation of NEPA and its regulations is entitled to substantial deference. See Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 355-56 (1989); Andrus v. Sierra Club, 442 U.S. 347, 358 (1979). The CEQ regulations direct agencies first to identify the project's purpose and need and set forth the alternatives that flow from that purpose and need. 40 C.F.R. § 1502.13. The agencies should then rigorously explore and evaluate objectively all reasonable alternatives, including reasonable alternatives that may not be "within the jurisdiction of the lead agency." 40 C.F.R. § 1502.14(c).

CEQ encourages agencies to carry out robust alternatives analyses that consider all reasonable alternatives, including those that are not within agencies' authorities. The real focus, however, must always be on a meaningful consideration of alternatives. In this particular situation, where NASA has signed the Agreement and committed to a cleanup standard to background, nothing under NEPA or CEQ regulations constrains NASA from looking beyond cleanup to background, even though some may consider the analysis unnecessary and inconsistent with the agreement NASA signed with the State. However, there is no requirement that NASA consider alternatives that cleanup to other standards that differ from the agreement with the State. The Supreme Court has stated that the concept of alternatives must be bounded by some notion of feasibility, Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 551 (1978), and under the specific facts of the cleanup at this time, feasibility is most sufficiently defined within the scope of cleanup to background. There would, of course, have to be a no-action alternative considered.

Indeed, as the Supreme Court has stated, "inherent in NEPA and its implementing regulations is a 'rule of reason,' which ensures that agencies determine whether and to what extent to prepare an [Environmental Impact Statement] based on the usefulness of any new potential information to the decisionmaking process." Department of Transportation v. Public Citizen, 541 U.S. 752, 767 (2004) (citing Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 373-374 (1989)). This "rule of reason" applies equally to the identification of the purpose and need statement and the alternatives, which NASA must consider in the context of the Agreement. In view of NASA's administrative cleanup resolution with the State of California, which turns upon NASA's commitment to clean the site to local background levels, CEQ's view is that — under this rule of reason — NASA is not compelled to consider less comprehensive cleanup measures as alternatives.

As to assisting the State and NASA in moving forward cooperatively, it is fully consistent with CEQ regulations for NASA and the State to coordinate their environmental reviews to the greatest extent possible. CEQ would recommend such coordination while allowing NASA to retain the integrity of its NEPA decision making authority. CEQ would propose that the State and NASA conduct face-to-face meetings with the goal of establishing an updated cleanup timetable. During the process of working on a timetable, the State and NASA will also be able to resolve other issues, including: (1) what information, including any site characterization information, NASA and the State can provide each other to facilitate NASA's NEPA process and the State's California Environmental Quality Act (CEQA) work; (2) how the NEPA and CEQA processes will work together; (3) what the State's timeline is for the CEQA process; and (4) whether an extension for completion of the cleanup could assist in facilitating coordination among the NASA and State efforts. CEQ would be pleased to assist NASA, the State, and the Committee as appropriate in fostering this coordination.

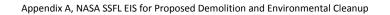
Thank you again for your letter. CEQ shares your commitment to ensuring that the Santa Susana Field Laboratory Site is cleaned up to background pursuant to the Agreement and that its lands be enjoyed by current and future residents of the area.

Sincerely.

Nancy H. Sutley

Chair

End of Appendix A



This page intentionally left blank.

Applicable Laws and Regulations

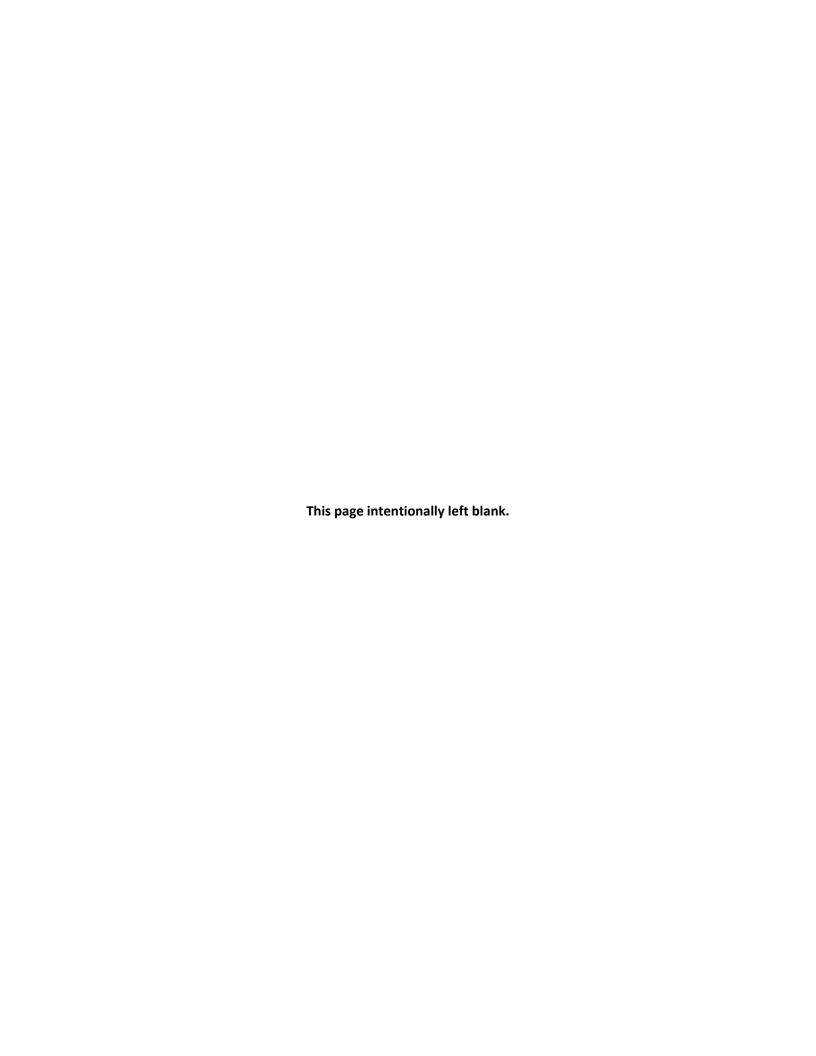


TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
General Regulatory Se	tting			
National Environmental Policy Act (NEPA) of 1969	Requirement of any federal to consider the environmental impacts of their proposed actions and the reasonable alternatives to those actions.	42 United States Code (U.S.C.) §4321 et seq.; Public Law 91- 190	Council on Environmental Quality All federal agencies (for Santa Susanna Field Laboratory, U. S. National Aeronautics and Space Administration)	http://ceq.hss.doe.gov/nepa/regs/nepa/nepa eqia.htm http://www.nasa.gov/agency/nepa/itm_NEP AProgram.html
Cultural Regulatory Se	tting			
National Historic Preservation Act (NHPA) of 1966	Requires federal agencies to consider the potential effects of their proposed actions on historic properties. Also referred to as Section 106 consultation.	16 U.S.C. § 470 et seq., as amended; Public Law 89-665	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.achp.gov/nhpa.html
Archeological and Historic Preservation Act (AHPA)	Federal agencies provide for the preservation of historical and archeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of any alteration of the terrain caused as a result of any federal construction project of federally licensed activity or program.	16 U.S.C. §§ 469-469c; Public Law 93-291	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.nps.gov/archeology/tools/Laws/AHPA.htm
Archaeological Resources Protection Act (ARPA) of 1979	Requirements that must be met before federal authorities can issue a permit to excavate or remove any archeological resource on federal or Indian lands.	16 U.S.C. §§ 470aa – mm; Public Law 96-95	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.nps.gov/archeology/tools/Laws/ arpa.htm

Applicable	Delevenes for CCFI	Citation	Administration / Degrand this America	II. wa sulinda
Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
The Native American Graves Protection and Repatriation Act (NAGPRA)	Requires federal agencies inventory holdings of Native American human remains and funerary objects and provide written summaries of other cultural items and provide greater protection for Native American burial sites and more careful control over the removal of Native American human remains, funerary objects, sacred objects, and items of cultural patrimony on federal and tribal lands.	25 U.S.C. §§ 3001-3013; Public Law 101-601	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.nps.gov/archeology/tools/Laws/ NAGPRA.htm
Biological Regulatory S	Setting			
Federal Endangered Species Act (ESA) of 1973	Requires federal agencies to avoid actions that might jeopardize the existence of threatened or endangered species, or destroy or adversely affect critical habitats of such species.	16 U.S.C. §§ 1531-1544, 87 Stat. 884, as amended	U. S. Fish and Wildlife Service National Oceanic Atmospheric Administration [although not applicable for Santa Susanna Field Laboratory, applicable for marine mammals]	http://www.fws.gov/laws/lawsdigest/ESACT. HTML http://www.fws.gov/endangered/esa- library/index.html#esa
Migratory Bird Treaty Act (MBTA) of 1918	Requires federal agencies to support migratory bird conservation.	16 U.S.C. §§ 703-712, as amended	U. S. Fish and Wildlife Service	http://www.fws.gov/laws/lawsdigest/migtrea .html http://law2.house.gov/uscode- cgi/fastweb.exe?getdoc+uscview+t13t16+618 9+0++%28%29%20%20AND%20%28%2816%2 9%20ADJ%20USC%29%3ACITE%20AND%20% 28USC%20w%2F10%20%28703%29%29%3AC ITE%20%20%20%20%20%20%20%20
Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)	Requires federal agencies to support migratory bird conservation.	66 Federal Register 3853	U. S. Fish and Wildlife Service Council on Environmental Quality	http://ceq.hss.doe.gov/nepa/regs/eos/eo131 86.html

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Bald and Golden Eagle Protection Act of 1940	Prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles (Haliaeetus leucocephalus) or golden eagles (Aquila chrysaetos), including their parts, nests, or eggs.	16 U.S.C. §§ 668-668c, 54 Stat. 250, as amended; 50 CFR 22	U. S. Fish and Wildlife Service	http://www.fws.gov/laws/lawsdigest/BALDEG L.HTML http://www.fws.gov/midwest/MidwestBird/E aglePermits/index.html
Conservation Programs on Government Lands (Sikes Act) [Integrated Natural Resource Management Plan]	Authorized conservation and rehabilitation programs on NASA and other federal lands.	16 U.S.C. §§ 670a-670o, 74 Stat. 1052, as amended; Public Law 93-452	U. S. Fish and Wildlife Service	http://www.fws.gov/laws/lawsdigest/SIKES.H TML http://www.fws.gov/habitatconservation/sike s_act.html
Federal Noxious Weed Act of 1975	Requires federal agencies to control the spread of noxious weeds.	7 U.S.C. § 2801 et seq.; 88 Stat. 2148; Public Law 93-629	U. S. Fish and Wildlife Service Bureau of Land Management U.S Department of Agriculture	http://www.fws.gov/laws/lawsdigest/fednox.html http://www.thecre.com/fedlaw/legal2/fedweed.htm http://www.blm.gov/wo/st/en/prog/more/weeds/blm_program.html
Executive Order 13112	Prepare and issue the first edition of a National Invasive Species Management Plan, detailing and recommending performance-oriented goals and objectives and specific measures of success for federal agency efforts concerning invasive species.	64 Federal Register 6183	U.S Department of Agriculture Council on Environmental Quality	http://www.invasivespeciesinfo.gov/laws/exe corder.shtml

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Federal Water Pollution Control Act (Clean Water Act) (CWA)	Regulation to protect surface waters and waterways	33 U.S.C. §§ 1251 - 1376; Chapter 758; P.L. 845, as amended 40 Code of Federal Regulations (CFR) Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/water_issues/progr ams/#wqassessment http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx _03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx _03/40cfrv20_03.html
California Endangered Species Act (CESA) of 1948	Law requiring the California Department of Fish and Game to work with all interested persons, agencies, and organizations to protect and preserve sensitive species and their habitats.	Fish and Game Code, Sections 2050 et seq.	California Department of Environmental Protection California Department of Fish and Game	http://www.dfg.ca.gov/habcon/cesa/ http://www.leginfo.ca.gov/cgi- bin/displaycode?section=fgc&group=02001- 03000&file=2050-2069 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=fgc&group=02001- 03000&file=2070-2079 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=fgc&group=02001- 03000&file=2080-2085
California Native Plant Protection Act (NPPA) of 1977	Law intended to preserve, protect, and enhance the endangered and rare plants of California.	Fish and Game Code Section 1900-1913	California Department of Environmental Protection California Department of Fish and Game	http://www.dfg.ca.gov/wildlife/nongame/t e _spp/nat_plnt_consv.html http://www.leginfo.ca.gov/cgi- bin/displaycode?section=fgc&group=01001- 02000&file=1900-1913
California Fish and Game Code	Regulates the taking or possession of birds, mammals, fish, amphibian, and reptiles.	California Law; Fish and Game Code, Divisions 0.5-13.5	California Department of Environmental Protection California Department of Fish and Game	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=fgc&codebody= &hits=20

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Air Quality and Greenh	ouse Gas Setting			
The Clean Air Act (CAA) of	Authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources.	42 U.S.C. §7401 et seq., as amended 40 CFR Part 68	U.S. Environmental Protection Agency	http://www.epa.gov/air/caa/
Greenhouse Gas (GHG) Reporting Program	Requires reporting of GHG data and other relevant information from large sources and suppliers in the United States.	40 CFR Part 98	U.S. Environmental Protection Agency	http://www.epa.gov/climatechange/emissions/ghgrulemaking.html
Ventura County Air Pollution Control District (VCAPCD)	Address fugitive dust on public and private roads, demolition and renovation, and soil decontamination, and enforcement of the General Conformity Rule to the VCAPCD.	Rules of the Ventura County Air Pollution Control District, Regulations I-XII	Ventura County Air Pollution Control Board	http://www.vcapcd.org/ http://www.vcapcd.org/Rulebook/RuleIndex. htm http://www.vcapcd.org/Rulebook/Rule4.htm http://www.vcapcd.org/Rulebook/RuleX.htm
South Coast Air Quality Management District (SCAQMD)	Rules that pertain to the proposed action, including those that address fugitive dust, and enforcement of the General Conformity Rule at the local level.	Air Quality Management District (AQMD) Regulations I- XXXV, Rules 101-3503	Air Quality Management District (AQMD) Governing Board	http://www.aqmd.gov/ http://www.aqmd.gov/rules/index.html http://www.aqmd.gov/rules/rulesreg.html
San Joaquin Valley Air Pollution Control District (SJVAPCD)	Rules that pertain to the proposed action, including those that address fugitive dust, and enforcement of the General Conformity Rule at the local level.	Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District, Regulations I-IX	Valley Air District Governing Board	http://www.valleyair.org/Home.htm
Water Regulatory Setti	ing		l	

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Federal Water Pollution Control Act (Clean Water Act) (CWA)	Regulation to protect surface waters and waterways	33 U.S.C. §§ 1251 - 1376; Chapter 758; P.L. 845, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/water_issues/progr_ams/#wqassessment http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
National Pollutant Discharge Elimination System (NPDES), CWA Section 402	Regulation of stormwater discharges from construction and disturbed land activities; regulates stormwater from construction activity; general permit for minimizing sediment and pollutant loading in stormwater discharging offsite.	33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issue s/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx 03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx 03/40cfrv20_03.html
Water Quality Certification, CWA 401	State certification process for discharge to waters of the United States that the discharge complies with other provisions of the CWA.	33 U.S.C. § 1341, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issue_s/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
Water Quality Impairments, CWA 303d [Identification of Areas with Insufficient Controls; Maximum Daily Load; Certain Effluent Limitations Revision]	Requires each state to provide a list of impaired waters that do not meet or are expected not to meet state water quality standards.	33 U.S.C. § 1313, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water issue s/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx 03/40cfrv19 03.html http://www.access.gpo.gov/nara/cfr/waisidx 03/40cfrv20 03.html

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Hazardous Waste Control	State regulatory information for managing hazardous waste (generators; transporters; facilities permitted with RCRA or standardized permits; and other authorizations and notifications).	California Code of Regulations, Title 22, Division 4.5 Environmental Health Standards for the Management of Hazardous Waste	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://www.dtsc.ca.gov/ http://www.dtsc.ca.gov/HazardousWaste/ind ex.cfm http://dtsc.ca.gov/SiteCleanup/Santa_Susana_Field_Lab/index.cfm http://weblinks.westlaw.com/toc/default.asp_x?Abbr=ca%2Dadc&Action=CollapseTree&AP=IE6E81020D4B911DE8879F88E8B0DAAAE&It_emKey=IE6E81020D4B911DE8879F88E8B0DAAAE&RP=%2Ftoc%2Fdefault%2Ewl&Service=T_OC&RS=WEBL12.01&VR=2.0&SPa=CCR-1000&pbc=DA010192&fragment#IE6E81020D4B911DE8879F88E8B0DAAAE
Porter-Cologne Water Quality Act	Established Regional Water Quality Control Boards throughout the state and requires projects that are discharging, or proposing to discharge, wastes that could affect the quality of the state's water to file a Report of Waste Discharge with the appropriate Regional Water Quality Control Boards.	California Law; Water Code Section 13000 et seq., Division 7, Chapter 4-10	California Department of Environmental Protection California Department of Toxic Substances Control	http://www.swrcb.ca.gov/laws_regulations/ http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=wat&codebody =&hits=20
California Water Code Section 13751	Requires that anyone who constructs, alters, or destroys a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well file a well completion report with the Department of Water Resources.	California Law; Water Code, Division 7, Chapter 10	California Department of Environmental Protection California Department of Toxic Substances Control	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=wat&codebody =&hits=20 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=wat&group=13001- 14000&file=13750.5-13755

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Basin Plans and Water Quality Objectives	Adopts water quality control plans, or basin plans, that establish water quality objectives to provide reasonable protection of beneficial uses and an implementation program for achieving water quality objectives within the basin plans.	California Code of Regulations, Title 23, Division 3-5	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/plans_policies/ http://www.waterboards.ca.gov/losangeles/ water_issues/programs/basin_plan/
Dewatering Activities	Removal of nuisance water from a construction site because of the high turbidity and other pollutants potentially associated with this activity. Water Quality Construction Best Management Practices Manual.	California Law; Water Code Section 13000 et seq., Division 7, Chapter 1-10 33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/laws regulations/ http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=wat&codebody =&hits=20 http://www.waterboards.ca.gov/water_issue s/programs/stormwater/constpermits.shtml
Stormwater Management Programs	Regulation of stormwater discharges from construction and disturbed land activities; regulates stormwater from construction activity; general permit for minimizing sediment and pollutant loading in stormwater discharging offsite.	California Law; Water Code Section 13000 et seq., Division 7, Chapter 6-10 33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issue s/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx 03/40cfrv19 03.html http://www.access.gpo.gov/nara/cfr/waisidx 03/40cfrv20 03.html
Geology Regulatory Se	tting	<u> </u>		
Historic Sites Act of 1935	Establishes a national registry of natural landmarks and protects outstanding examples of major geological features. Also serves to protect fossils as prehistoric structures and objects of scientific interest.	16 U.S.C. §§ 461-467; Public Law 74-292	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.blm.gov/heritage/docum/histsite_ .pdf

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Federal Land Policy and Management Act (FLPMA) of 1976	Charges federal agencies to manage public lands in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, archaeological, and water resources and, where appropriate, to preserve and protect certain public lands in their natural condition; to periodically inventory public lands so that the data can be used to make informed land-use decisions; and to regulate the use and development of public lands and resources through easements, licenses, and permits.	Public Law 94-579	U.S. Department of Interior Bureau of Land Management	http://www.blm.gov/flpma/
National Historic Preservation Act (NHPA) of 1966	Provides for the survey, recovery, and preservation of significant paleontological data when such data might be destroyed or lost due to a federal, federally licensed, or federally funded project.	16 U.S.C. § 470 et seq., as amended; Public Law 89-665	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.achp.gov/nhpa.html
Regulations Relating to Public Lands	Prohibits the collection of scientific resources, including vertebrate fossils, without a permit, as well as the use of fossils found on federal land for commercial purposes.	43 CFR 8365.1-5	U.S. Department of Interior Bureau of Land Management	http://www.gpo.gov/fdsys/search/pagedetail s.action;jsessionid=qCHDTYQchPNLSv20nCy6 HXv1hLTh1Kv7JQkKCdr0GFdyzRyhbbvJ!17086 42603!- 1894506425?st=Nonrenewable&collection=C FR&historical=false&granuleId=CFR-2010- title43-vol2-sec8365-1-5&packageId=CFR- 2010-title43-vol2
Omnibus Public Land Management Act (OPLMA), Paleontological Resources Preservation Act (PRPA) of 2009	Management and protection of paleontological resources on federal land using scientific principles and expertise.	16 U.S.C. § 470aaa; Public Law 111-011	U.S. Department of Interior U.S. Department of Agriculture	http://www.blm.gov/wo/st/en/prog/more/C RM/paleontology/paleontological_regulations .html#Omnibus http://www.blm.gov/wo/st/en/prog/more/C RM/paleontology/fossil_collecting.html

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands	System used to classify paleontological resource potential on public lands in order to assess possible resource impacts and mitigation needs for federal actions involving surface disturbance, land tenure adjustments, and land-use planning. Implementation of the PFYC system will not mandate changes to existing land use plans, project plans, or other completed efforts. Integration into plans presently being developed is discretionary.	Instruction Memorandum No. 2008-009	U.S. Department of Interior Bureau of Land Management	http://www.blm.gov/wo/st/en/info/regulations/Instruction Memos and Bulletins/national instruction/20080/im 2008-009.html
Hazardous Materials a	and Waste Regulatory Settings			
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Known as Superfund. Provides broad federal authority to respond to directly to releases or threatened releases of hazardous substances.	42 U.S.C. §9601 et seq., as amended	U.S. Environmental Protection Agency	http://www.epa.gov/superfund/policy/cerclahtm
The Clean Air Act (CAA) of 1970	Authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources.	42 U.S.C. §7401 et seq., as amended 40 CFR Part 68	U.S. Environmental Protection Agency	http://www.epa.gov/air/caa/
Atomic Energy Act of 1954	Radioactive materials and wastes regulate by U.S. Nuclear Regulatory Commission.	42 U.S.C. § 2014(e), as amended; Public Law 83-703 NUREG-0980, Volume 1, Number 9	U.S. Nuclear Regulatory Commission	http://www.nrc.gov/about-nrc/governing-laws.html#aea-1954 http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0980/v1/
Low-level Radioactive Waste Policy Amendments Act of 1985	U.S. Nuclear Regulatory Commission delegated authority for low-level radioactive materials and waste to Department of Health Services.	42 USC 2021b et seq., as amended; Public Law 99-240 NUREG-0980, Volume 1, Number 9	U.S. Nuclear Regulatory Commission California Department of Environmental Protection	http://www.nrc.gov/about-nrc/governing- laws.html#llrwpaa-1985 http://www.nrc.gov/reading-rm/doc- collections/nuregs/staff/sr0980/v1/

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Health and Safety Code	Department of Health Services regulates handling and use of ionizing radiation.	California Law; Health and Safety Code, Division 1-120	California State Department of Health Services	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=hsc&codebody= &hits=20
Federal Water Pollution Control Act (Clean Water Act) (CWA)	Regulation to protect surface waters and waterways.	33 U.S.C. §§ 1251 - 1376; Chapter 758; P.L. 845, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/water_issues/progr ams/#wqassessment http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx _03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx _03/40cfrv20_03.html
National Toxics Rule	Sets chemical-specific, numeric water quality criteria for priority toxic pollutants to bring states into compliance with the requirements of Section 303(c)(2)(B) of CWA.	CWA Section 303(c)(2)(B) 40 CFR Part 131	U.S. Environmental Protection Agency	http://water.epa.gov/lawsregs/rulesregs/ntr.cfm
California Toxic Rule	Sets numeric water quality criteria for priority toxic pollutants and other water quality standards provisions to be applied to waters in the State of California.	CWA Section 303(c)(2)(B); section 304(a); and section 307(a)	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://water.epa.gov/lawsregs/rulesregs/ctr/
Spill Prevention, Control, and Countermeasure Rule (SPCC)	Designed to prevent or contain discharge or threat of discharge of oil. Facilities are required to prepare a written SPCC Plan for oil storage above a certain threshold.	40 CFR 112	California Department of Environmental Protection Ventura County Environmental Health Division U.S. Environmental Protection Agency	http://www.calepa.ca.gov/cupa/aboveground

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
National Pollutant Discharge Elimination System (NPDES), CWA Section 402	Regulation of stormwater discharges from construction and disturbed land activities; regulates stormwater from construction activity; general permit for minimizing sediment and pollutant loading in stormwater discharging offsite.	33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issue s/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx _03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx _03/40cfrv20_03.html
Resource Conservation and Recovery Act (RCRA)	Primary law governing hazardous waste generation, transport, and treatment/disposal.	42 U.S.C § 6901 et seq., as amended	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://www.dtsc.ca.gov/ http://www.dtsc.ca.gov/HazardousWaste/ind ex.cfm http://www.epa.gov/compliance/civil/rcra/rc raenfstatreq.html
Occupational Safety and Health Standards (OSHA)	Requirements for equipment for protecting worker health and safety used to store and handle hazardous materials	California Code of Regulations, Title 8 29 CFR 1910 et seq. and 29 CFR 1926 et seq.	California Department of Industrial Relations U.S. Department of Labor	https://www.dir.ca.gov/counters/t8index.htm http://ecfr.gpoaccess.gov/cgi/t/text/text- idx?c=ecfr&sid=7e2f86cc16e34deca036ee425 8c5ff0c&tpl=/ecfrbrowse/Title29/29cfr1910a main 02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text- idx?c=ecfr&rgn=div5&view=text&node=29:8. 1.1.18idno=29

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Hazardous Materials Regulations	Regulations covering all aspects of hazardous materials packaging, handling, and transportation.	49 CFR Parts 172, 173, 177, 178, 179, and 180	U.S. Department of Transportation	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr172_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr173_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr177_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr178_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr179_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr179_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr180_main_02.tpl
California Water Code	Addresses compliance with the provisions of the federal CWA and waste discharge requirements.	California Law; Water Code, Division 7, Chapters 4 and 5.5	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=wat&codebody =&hits=20 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=wat&group=13001- 14000&file=13260-13275 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=wat&group=13001- 14000&file=13370-13389

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
California Hazard Communication Regulation	California Code of regulations that lists hazardous chemicals relating to the Hazardous Substance Information and Training Act; addresses control of hazardous substances; and addresses hot, flammable, poisonous, corrosive, and irritant substances.	California Code of Regulations, Title 8, Section 339, Section 3200 et seq., Section 5139 et seq., and Section 5160 et seq.	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	https://www.dir.ca.gov/title8/339.html https://www.dir.ca.gov/Title8/sub7.html
Health and Safety Code	Basic hazardous waste law for California	California Law; Health and Safety Code, Division 20, Chapter 6.5, Section 253000, Section 25500, and Section 25531	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=hsc&codebody= &hits=20
Aboveground Petroleum Storage Act	California law that provides for implementation provisions of the federal SPCC Rule under the CWA.	California Health and Safety Code Sections 25270 to 25270.13	California Environmental Protection Agency	http://www.calepa.ca.gov/cupa/aboveground
Safe Drinking Water and Toxics Enforcement Act	Law requiring the state to identify chemicals that cause cancer and reproductive toxicity, contains requirements for informing the public about the presence of these chemicals, and prohibits discharge of the chemicals into sources of drinking water.	Proposition 65	California Environmental Protection Agency Office of Environmental Health Hazard Assessment	http://oehha.ca.gov/prop65/law/P65law7200 3.html http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi- bin/calawquery?codesection=hsc&codebody= &hits=20 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=hsc&group=25001- 26000&file=25270-25270.13
California Fire Code	Regulates the storage, use, and dispensing of hazardous materials, including materials that pose a physical or a health hazard.	Title 24 California Code of Regulations, Part 9, Chapters 27-43	California Department of Environmental Protection	http://publicecodes.citation.com/st/ca/st/b3 00v10/index.htm

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Los Angeles Regional Water Quality Control Board	Responsible for regulating surface water discharge activities at SSFL.	CWA, 33 U.S.C. §1251 et seq. and § 1342, as amended	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/rwqcb4/ http://www.swrcb.ca.gov/water_issues/programs/#wqassessment http://www.waterboards.ca.gov/water_issues/programs/npdes/#process
Health and Safety Reg	ulatory Setting			
Occupational Safety and Health Standards (OSHA)	Requirements for equipment for protecting worker health and safety used to store and handle hazardous materials	California Code of Regulations, Title 8 29 CFR 1910 et seq. and 29 CFR 1926 et seq.	California Department of Industrial Relations U.S. Department of Labor	https://www.dir.ca.gov/counters/t8index.htm http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=7e2f86cc16e34deca036ee425 8c5ff0c&tpl=/ecfrbrowse/Title29/29cfr1910amain 02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=29:8. 1.1.1.1&idno=29
California Hazard Communication Regulation	California Code of regulations that lists hazardous chemicals relating to the Hazardous Substance Information and Training Act; addresses control of hazardous substances; and addresses hot, flammable, poisonous, corrosive, and irritant substances.	California Code of Regulations, Title 8, Section 339, Section 3200 et seq., Section 5139 et seq., and Section 5160 et seq.	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	https://www.dir.ca.gov/title8/339.html https://www.dir.ca.gov/Title8/sub7.html
Ventura County General Plan, Hazards Appendix	Provides discussions about physical, social, and other effects of hazards that are relevant to the ongoing and proposed activities.	Section 65300 of the California Government Code	Ventura County Resource Management Agency	http://www.ventura.org/rma/planning/general plan/general plan.html
Emergency Preparedness Program				

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
NASA Occupational Health Program Procedures				
Traffic Regulatory Sett	ting			
Hazardous Material Regulations	Requires proper handling and storage of hazardous materials during transportation.	49 CFR, Subtitle B, Chapter 1, Subchapter C, Section 171-177 and Subtitle B, Chapter 3, Subchapter B, 350-399	U.S. Department of Transportation and California Department of Transportation	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv2 02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=4bbe4a2a0f15639beb030d232b1487 42&c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv5 02.tpl#300
Hazardous Waste Haulers - Transportation	Addresses the safe transport of hazardous materials.	California Health and Safety Code §25160 et seq.	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25160-25166.5 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25167.1-25169.3 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25169.5-25169.8
Transportation of Hazardous Material	Authorizes the issuance of licenses by the Commissioner of the CHP for the transportation of hazardous materials including explosives.	California Vehicle Code §§2500-2505 and 2531-2532	California Department of Transportation	http://www.leginfo.ca.gov/cgi- bin/displaycode?section=veh&group=02001- 03000&file=2500-2505 http://www.leginfo.ca.gov/cgi- bin/displaycode?section=veh&group=02001- 03000&file=2531-2532
Transporting of Hazardous Materials	Requires transporters to meet proper storage and handling standards for transporting hazardous materials on public roads.	California Vehicle Code §31300 et seq.	California Department of Transportation	http://www.leginfo.ca.gov/cgi- bin/displaycode?section=veh&group=31001- 32000&file=31301-31309

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Transportation of Hazardous Material - Licensing	Regulates the licensing of carriers of hazardous materials and includes noticing requirements.	California Vehicle Code §32000 - 32053	California Department of Transportation	http://www.leginfo.ca.gov/cgi- bin/displaycode?section=veh&group=31001- 32000&file=32000-32004
Flammable and Combustible Liquids Administration and Regulation	Establishes special requirements for the transportation of flammable and combustible liquids over public roads and highways.	California Vehicle Code §34000 - 34100	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=33001-34000&file=34000-34006 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34019-34024 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34060-34064 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34100
Safety Regulations	Regulates the safe operation of vehicles, including those used to transport hazardous materials.	California Vehicle Code §§34500, 34501, 34501.2, 34501.3, 34501.4, 34501.10, 34505.5-7, 34506, 34507.5, and 34510-11	California Department of Transportation	http://www.leginfo.ca.gov/cgi- bin/displaycode?section=veh&group=34001- 35000&file=34500-34520.5
Care and Protection of State Highways	Requires permits for any load that exceeds Caltrans weight, length, or width standards for public roadways.	California Vehicle Code §35780; California Streets and Highways Code §660-711	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=35001-36000&file=35780-35796 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=660-661 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=670-695 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=700-711

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
	Regulates weight and load limitations.	California Vehicle Code §35550-35559	California Department of Transportation	http://www.leginfo.ca.gov/cgi- bin/displaycode?section=veh&group=35001- 36000&file=35550-35558
Public Agency General Plan	Project must conform to the General Plan.	California State Planning Law, Government Code Section 65302	California Department of Transportation	http://www.leginfo.ca.gov/cgi- bin/displaycode?section=gov&group=65001- 66000&file=65300-65303.4
Noise Regulatory Setti	ng			
Los Angeles County General Plan	Existing Adopted General Plan	Section 65300 of the California Government Code	Los Angeles Department of Regional Planning	http://planning.lacounty.gov/generalplan/existing
Noise Control Ordinance of Los Angeles County	Noise Element in the existing Adopted General Plan	Section 65300 of the California Government Code	Los Angeles Department of Regional Planning	http://planning.lacounty.gov/assets/upl/project/gp_web80-noise-element.pdf
Environmental Justice	and Protection of Children Regulatory S	Setting		
Federal Actions to Address Environmental Justice in Minority Populations and Low- Income Populations	Requires each federal agency to achieve environmental justice to the extent practicable by identifying and addressing disproportionately high adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.	Executive Order 12898	All federal agencies (for Santa Susana Field Laboratory, U.S. National Aeronautics and Space Administration)	http://www.epa.gov/fedrgstr/eo/eo12898.pd f
Protection of Children from Environmental Health Risks and Safety Risks	Requires federal agencies make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.	Executive Order 13045	All federal agencies (for Santa Susana Field Laboratory, U. S. National Aeronautics and Space Administration)	http://frwebgate.access.gpo.gov/cgi- bin/getdoc.cgi?dbname=1997 register&docid =fr23ap97-130.pdf

TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

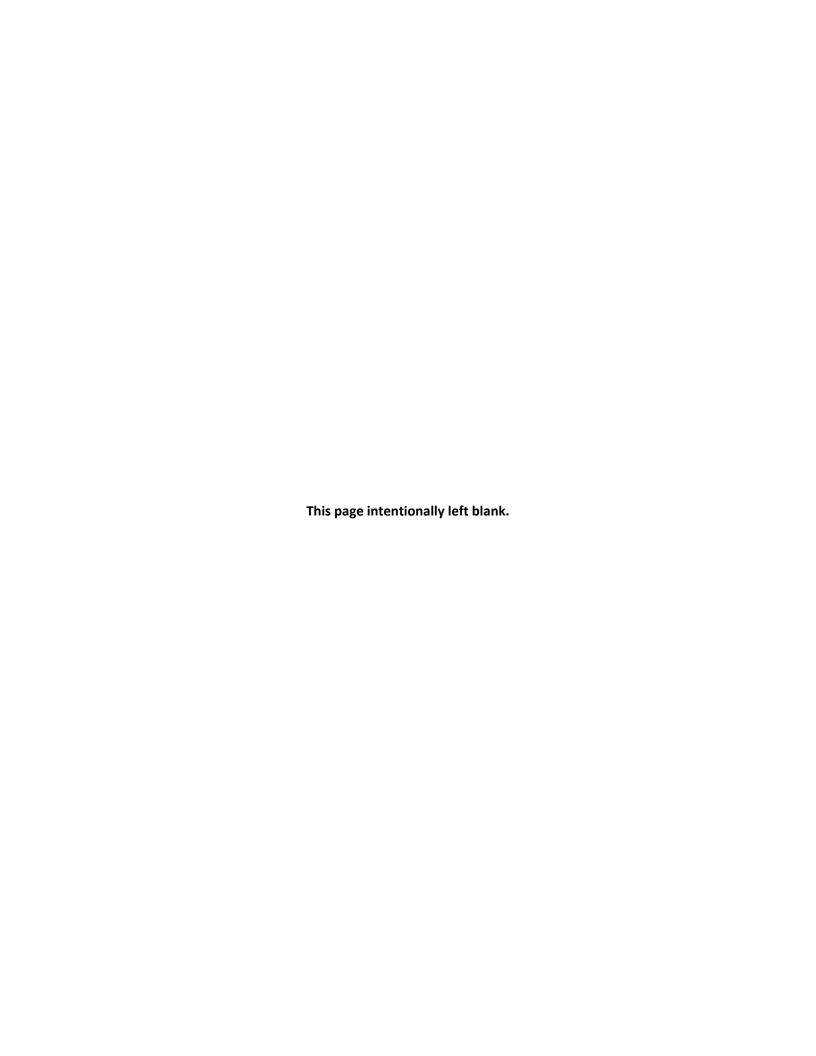
Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Environmental Justice Guidance Under the National Environmental Policy Act	Provides guidance for identifying minority populations where the minority population of the affected area either exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.	42 U.S.C. § 4321 et seq. Executive Order 12898 40 CFR Parts 1500-1508	U.S. Environmental Protection Agency All federal agencies (for Santa Susana Field Laboratory, U. S. National Aeronautics and Space Administration)	http://www.epa.gov/compliance/ej/resource s/policy/ej guidance nepa ceq1297.pdf
Environmental Justice Strategy	Ensure the integration of environmental justice into U. S. National Aeronautics and Space Administration programs, policies, and activities	42 U.S.C. § 4321 et seq. Executive Order 12898 40 CFR Parts 1500-1508	U. S. National Aeronautics and Space Administration	http://www.epa.gov/compliance/ej/resource s/publications/interagency/nasa-strategy- 1995.pdf

Appendix B, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

End of Appendix B

APPENDIX C

Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura County, California



Confidential

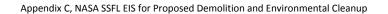
Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura County, California

Prepared for

National Aeronautics and Space Administration

Huntsville, Alabama

February 2014



This page intentionally left blank.

Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura County, California

Report Prepared For:

National Aeronautics and Space Administration George C. Marshall Space Flight Center Marshall Space Flight Center, AL 35812

Prepared by:

CH2M HILL 6 Hutton Centre Drive, Suite 700 Santa Ana, CA 92707

February 2014

National Archeological Database (NADB)

Type of Study: Literature Search, Survey, and Evaluation
Sites Recorded:

Isolates Recorded: None
USGS Quadrangle: Calabasas, CA;

Acreage: 490 acres
Level of Investigation: NEPA and Section 106

Key Words: Simi Valley, NASA, Alfa Test Area, Bravo Test Area, Coca Test Area, Historic Districts, Burro Flats, NEPA, Isolate, prehistoric site, Chumash, Gabrieleño, Tataviam

STATEMENT OF CONFIDENTIALITY:

Due to the sensitive nature of cultural resources described herein, this report is confidential and should be withheld from public distribution, in accordance with 43 CFR 7.18[a][1] and Section 304 of the National Historic Preservation Act.



This page intentionally left blank.

Executive Summary

This report provides the results of several phases of work designed to locate and document historic properties within the National Aeronautics and Space Administration (NASA)-administered Liquid Oxygen (LOX) Plant Area I and Area II at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. This study has been prepared in support of Section 106 of the National Historic Preservation Act (NHPA), which requires federal agencies to identify historic properties and take into account the effects of their undertakings on historic properties, as well as the National Environmental Policy Act (NEPA). NASA has prepared an Environmental Impact Statement (EIS) for the undertaking, or Proposed Action, that includes the results of this study.

Cultural resources include prehistoric and historic archeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; locations of important historic events; and Native American sites and cultural properties such as sites of traditional cultural importance to various groups. 36 *Code of Federal Regulations* (CFR) 800 defines a historic property as any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the National Register of Historic Places (NRHP).

Under Section 110 and Section 106 of the NHPA, NASA conducted cultural resource inventories of the NASA-administered portion of SSFL in 2007, 2008, 2009, and 2011. These inventories together include the entirety of the NASA-administered portion of SSFL and some areas outside this area that likely will need to be remediated as a part of this undertaking, covering a total of 198.3 hectares (ha) (490 acres). Previous work consisted of using the Universal Transverse Mercator (UTM) coordinate system to record the locations of the features at the Burro Flats Site with a handheld Trimble global positioning system (GPS) unit, recordation of site (Emmick and Bard, 2008; McClintock, Wilt, and Emmick, 2009), and recordation of in 2010 (Hogan and Tang, 2010).

An assessment of the built environment was conducted in 2007 by Archaeological Consultants, Inc., and Weitze Research (ACI and WR). This survey assessed 135 federally owned buildings, structures, and sites within NASA-administered LOX Plant Area I and Area II of SSFL. The results of this investigation identified three historic districts—the Alfa, Bravo, and Coca Test Areas—and nine individually eligible structures within the districts (ACI and WR, 2009). The Alfa, Bravo, and Coca Test Area historic districts are eligible for listing in the NRHP, and within these three historic districts, six test stands and three associated control houses are individually eligible for the NRHP. The California State Historic Preservation Officer (SHPO) concurred with the eligibility of these three districts and their contributing elements, as well as with the individual eligibility of the nine structures, on May 15, 2008. Correspondence summaries are included in Appendix B.

NASA initiated NHPA Section 106 consultation with the California SHPO and the Advisory Council on Historic Preservation (ACHP) on June 30, 2011. The initiation letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. The Area of Potential Effects for this project was developed in consultation with the SHPO in 2011 and 2012.

NASA has found that the Proposed Action—demolition of up to 100 percent of structures, soil cleanup to background levels, and groundwater cleanup—would result in an adverse effect on historic properties, as detailed in the effects analysis and findings in the cultural resources subsection of Section 4 of the EIS. Consultation with the SHPO, ACHP, Native Americans, and other consulting parties is ongoing. This consultation will culminate in measures to avoid, minimize, or mitigate adverse effects on historic properties that will be formalized in either an agreement document or in the Record of Decision associated with the EIS.

A copy of this report will be filed with the South Central Coastal Information Center of the California Historical Resources Information System located at California State University, Fullerton, in accordance with the Office of Historic Preservation's Information Management program.



This page intentionally left blank.

Execu	tive Su	mmary	v		
Acron	yms an	nd Abbreviations	ix		
1	Intro 1.1 1.2	Proposed Action	1-1		
	1.3	Area of Potential Effects			
	1.4	Sacred Sites			
	1.5	Traditional Cultural Properties			
	1.6	Cultural Flora and Fauna	1-6		
2	Setting				
	2.1	Environmental Setting			
	2.2	Cultural Context			
		2.2.1 Early Holocene (9,600 cal B.C. to 5,600 cal B.C.)			
		2.2.2 Middle Holocene (6,000 cal B.C. to cal A.D. 500)			
	• •	2.2.3 Late Holocene (cal A.D. 500 to Historic Contact)			
	2.3	Ethnohistory			
		2.3.1 Chumash			
		2.3.2 Fernandeño			
	2.4	2.3.3 Tataviam			
	2.4	2.4.1 Spanish/Mission Period (1769 to 1834)			
		2.4.2 Mexican/Rancho Period (1821 to 1848)			
		2.4.3 American Period (1848 to Present)			
		2.4.4 Santa Susana Field Laboratory			
3	Previous Investigations				
	3.1	Archival Research			
	3.2	Field Inventory Methodologies			
	3.3	Results of Previous Investigations	3-6		
		3.3.1 Archeological Resources			
		3.3.2 Historic Architectural Resources	3-9		
4		ultation			
	4.1	Native American Consultation			
		4.1.1 Native American Heritage Commission			
	4.2	4.1.2 Tribal Outreach			
5		oric Properties			
3	5.1	•			
	5.2				
		5.2.1 Traditional Cultural Properties and Cultural Landscapes			
		5.2.2 Archeological Resources			
		5.2.3 Architectural Resources	5-4		
6	Sumr	mary of Project Effects			
	6.1	Effects Finding from Proposed Action			
		6.1.1 Traditional Cultural Property	6-1		

		6.1.2 Archeological Resources	6-1		
		6.1.3 Architectural Resources	6-2		
		6.1.4 Indian Sacred Site	6-2		
		6.1.5 Cultural Flora and Fauna	6-3		
	6.2	Resolution of Adverse Effect	6-7		
7	Concl	usions	7-1		
8	Bibliography				
Appe	ndixes				
A B	Representative Photographs Consultation Record				
C D	-	ct Personnel Qualifications dential Cultural Resources Maps			
Table	s				
1	Flora	and Fauna with Recognized Native American Cultural Uses	1-9		
2		ral Resources Studies Previously Conducted within the APE			
3	Previously Recorded Historic Properties in the APE				
4		ously Recorded Resources within 1-mile of the APE			
5	Site	: Cross-Reference for Site Numbers, Loci, Galleries, and Features			
6		e American Individuals and Groups Contacted by NASA			
7		Santa Susana Field Laboratory Environmental Cleanup Section 106 Consulting Parties			
8 9		Identified Archeological Resources in the APE National Register of Historic Places Status of Historic Structures within the APE			
3	Natio	mai negister of mistoric mates status of mistoric structures within the Ar E			
Figure	es				
1	_	nal Map			
2		of Potential Effects			
3		Area I Overview			
4		Area II Overview			
5		Area II, Example of Vegetation Onsite			
6		Area II Rock Outcrop, an Example of an Opportunistically Surveyed Area			
7		Area II Coca Test Stands			
8	Propo	osed Soil Remediation Area under the Proposed Action	b-5		

Acronyms and Abbreviations

ACI Archaeological Consultants, Inc.

ACHP Advisory Council on Historic Preservation

AFP Air Force Plant

amsl above mean sea level

AOC Administrative Order on Consent

APE area of potential effects
Boeing The Boeing Company

CEQA California Environmental Quality Act of 1970

CFR Code of Federal Regulations

CHRIS California Historical Resources Information System

CRHR California Register of Historical Resources
DMJM Daniel, Mann, Johnson & Mendenhall, Inc.
DPR Department of Parks and Recreation

DoD U.S. Department of Defense
EIS Environmental Impact Statement

EO executive order

ft feet

GH2 gaseous hydrogen GN2 gaseous nitrogen

GPS global positioning system
GSA General Services Administration

ha hectare

ICRMP Integrated Cultural Resources Management Plan

JP4 jet-propulsion fuel

km kilometer m meter

LH2 liquid hydrogen LOX Liquid Oxygen Plant

n.d. not dated

NAA North American Aviation

NAGPRA Native American Graves Protection and Repatriation Act of 1990

NAHC Native American Heritage Commission

NASA National Aeronautics and Space Administration

NEPA National Environmental Policy Act
NHPA National Historic Preservation Act

NPS National Park Service

NRHP National Register of Historic Places
OHP California Office of Historic Preservation

PA Programmatic Agreement

ROD Record of Decision

SCCIC South Central Coastal Information Center

SHPO State Historic Preservation Officer
SSFL Santa Susana Field Laboratory

U.S. United States
U.S.C. United States Code
USAF U.S. Air Force

USGS U.S. Geological Survey

UTM Universal Transverse Mercator

WR Weitze Research yd³ cubic yards

SECTION 1

Introduction

This report provides the results of several phases of cultural resource assessments within the National Aeronautics and Space Administration (NASA)-administered Liquid Oxygen (LOX) Plant Area I and Area II at the Santa Susana Field Laboratory (SSFL) in Ventura County, California (Figure 1). The Proposed Action is to remediate the environment to a level that meets NASA's environmental cleanup responsibilities and to undertake the demolition actions necessary to support both remediation and property disposition of the NASA-administered portion of SSFL. This report has been prepared in support of Section 106 of the National Historic Preservation Act (NHPA), as well as the National Environmental Policy Act (NEPA). Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings (the Proposed Action) on historic properties. NASA has prepared an Environmental Impact Statement (EIS) for the undertaking that includes the results of this study. The Integrated Cultural Resources Management Plan (ICRMP) for SSFL, published in 2009, also provides guidance about how to identify, evaluate, and treat cultural resources at SSFL in compliance with NASA policy and state and federal regulations (NASA, 2009).

SSFL is located on 1,153 hectares (ha) (2,850 acres) in Ventura County, California, approximately 11.3 kilometers (km) (7 miles) northwest of Canoga Park and approximately 48.3 km (30 miles) northwest of downtown Los Angeles. SSFL is composed of four administrative areas known as Areas I, II, III, and, IV and two unnumbered areas known as "Undeveloped Area." NASA administers 16.9 ha (41.7 acres) within LOX Plant Area I and all 165.7 ha (409.5 acres) of Area II. The Boeing Company (Boeing) owns the remaining property within Areas I, III, and IV, and the two undeveloped areas. Specifically, the project area is located within Township 2 North, Range 17 West, of an unsectioned area of the 1952 (photo revised 1967) *Calabasas, California* 7.5' U.S. Geological Survey (USGS) quadrangle maps.

Since the mid-1950s, when Areas I and II were acquired by the United States (U.S.) Air Force (USAF), this site has been used for developing and testing rocket engines. Four test stand complexes (Alfa, Bravo, Coca, and Delta) were constructed in Area II between 1954 and 1957. Area II and the LOX Plant portion of Area I were transferred to NASA from the USAF in the 1970s.

This assessment includes a review of previous studies and pedestrian surveys within the Area of Potential Effects (APE) and the results of these investigations, as well as a summary of effects on historic properties from the Proposed Action. The full analysis of the effects of the Proposed Action on historic properties is contained in Section 4 of the EIS.

This report includes several appendixes: Appendix A contains representative photographs from the 2011 field survey; Appendix B contains a summary of the consultation record; Appendix C provides project personnel qualifications; and Confidential Appendix D depicts the cultural resources located within the APE. The maps in Appendix D are kept confidential to protect the archeological sites because of their sensitive nature. Section 9 of the Archaeological Resources Protection Act of 1979 and 36 *Code of Federal Regulations* (CFR) 800.11(c) provide discussions regarding the confidentiality of sites. The public version of this report has been redacted in certain sections in order to protect the archeological sites.

Project personnel included Principal Investigator/Field Director for the 2011 investigation Gloriella Cardenas, M.A., RPA, cultural resources specialist Michelle Kaye, Ph.D. Senior cultural resources specialist Clint Helton, M.A., RPA, provided senior technical review. Secretary of the Interior-qualified architectural historians Lori Price and Sara Orton contributed to this analysis. Additional review and research was conducted in 2013 by Natalie Lawson, M.A., RPA.

1.1 Proposed Action

NASA entered into an Administrative Order on Consent (AOC) for Remedial Action with the California Department of Toxic Substances Control (DTSC) on December 6, 2010, "to further define and make more specific NASA's obligations with respect to the cleanup of soils at Santa Susana Field Laboratory (SSFL)." As such, NASA prepared

an EIS to analyze the potential environmental impacts of demolition and cleanup activities on the NASA-administered portion of SSFL. The Proposed Action analyzed and evaluated in the EIS includes demolition of up to 100 percent of structures within the APE, as well as ancillary structures, including 55 structures within the boundaries of the three historic districts. It should be noted that even if demolition is not necessary to meet cleanup goals, removal of a structure might occur as NASA prepares the site for disposition. The Proposed Action also includes soil cleanup to background levels through excavation and offsite disposal of the contaminated soil, and ex situ and in situ soil remediation technologies. The total area of the soil remediation footprint is approximately 105 acres and entails cleanup of approximately 500,000 cubic yards (yd³) of contaminated soil within the APE. Finally, the Proposed Action includes groundwater cleanup within the APE. Section 2 of the EIS describes the Proposed Action and cleanup technologies in greater detail.

As part of excavation and offsite disposal, approximately 320,000 yd³ of soil (64 percent of the total contaminated soil) must be removed from SSFL because it is considered non-treatable contaminated soil and must be disposed of offsite. Stratification (or layering) of the contamination could require that the majority of contaminated areas would have to have the top 2 feet (ft) of non-treatable soil excavated, removed, and disposed offsite. The remaining approximately 180,000 yd³ of contaminated soil (36 percent of the total contaminated soil) is considered treatable, but might need to be excavated if none of the remediation technologies are found to be effective in meeting the cleanup goals. The ex situ soil remediation technologies being considered (Thermal Desorption, Soil Washing, Chemical Oxidation, and Land Farming) would be used only after the 320,000 yd³ or more of non-treatable soil has been excavated and removed. These technologies would be used to remediate the remaining 180,000 yd³ of treatable soil. The in situ soil remediation technologies (Soil Vapor Extraction, Anaerobic or Aerobic Biological Treatment, and Chemical Oxidation or Reduction) also would only be used for treatable soils; the soils would be treated in place and would not require excavation.

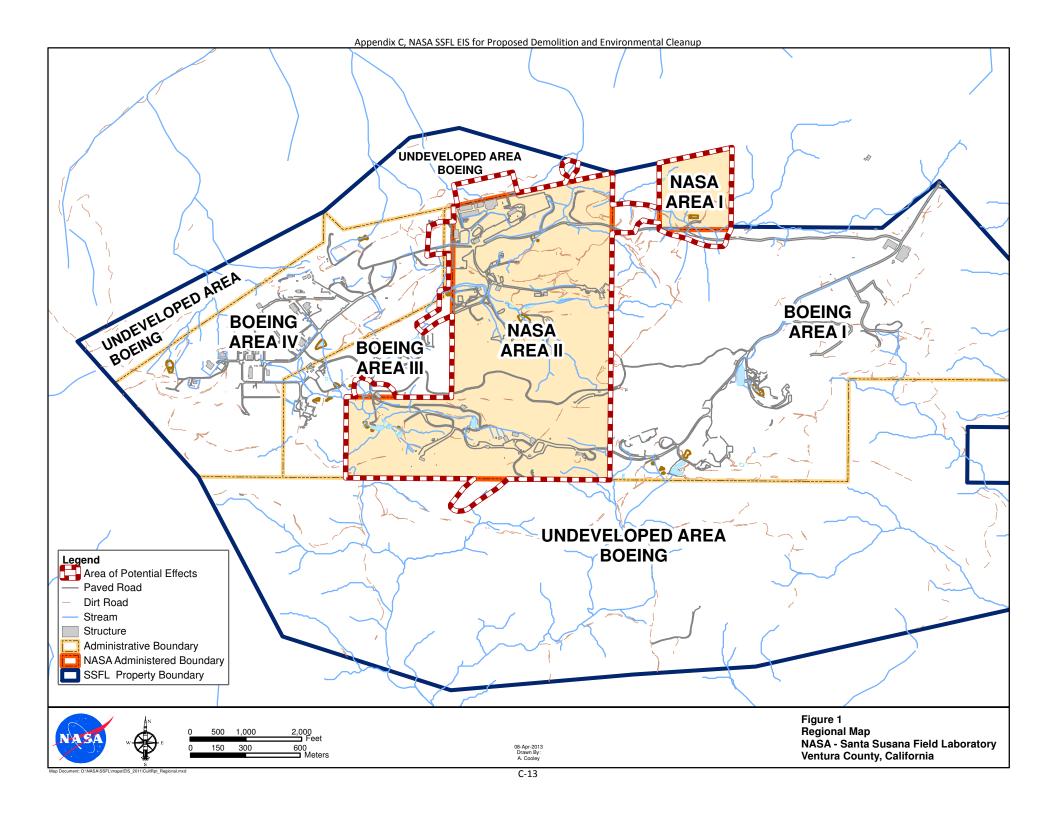
The groundwater remediation technologies to be considered include Pump and Treat, Vacuum Extraction, Iron Particle Injection, Heat-Driven Extraction, In situ Chemical Oxidation, In situ Enhanced Bioremediation, Monitored Natural Attenuation, and Institutional Controls. One or a combination of these technologies might be applied to meet the groundwater cleanup goals. Some ground disturbance would be necessary for the installation of wells, boreholes, piping, manifolds, tanks, or a power source, but this work could be done in discrete locations to minimize impacts. Depths of wells and boreholes for these technologies could range from approximately 50 to 900 ft below ground surface. The drills for the wells would be 8 inches or less in diameter, more likely 4.5 to 5 inches in diameter. The piping would be above ground and would be on small concrete pilings.

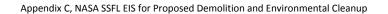
1.2 National Register of Historic Places Eligibility

The preservation of historic properties became national policy first with the passage of the Antiquities Act of 1906. The Historic Sites Act of 1935 continued the goal of preserving historic properties. Finally, the NHPA was passed in 1966. The National Register of Historic Places (NRHP) was established as part of the NHPA.

Cultural resources include prehistoric and historic archeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; locations of important historic events; and sites of traditional or cultural importance to various groups. 36 CFR 800 defines a historic property as any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the NRHP. The criteria used to evaluate properties for the NRHP are provided in 36 CFR 60 and listed in the following bullets. A resource must meet one or more of these criteria to be considered for eligibility:

- Be associated with events that have made a significant contribution to the broad patterns of history (Criterion A).
- Be associated with the lives of persons significant to our past (Criterion B).
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components might lack individual distinction (Criterion C).
- Have yielded, or have the potential to yield, information important to prehistory or history (Criterion D).





This page intentionally left blank.

Generally, properties must be 50 years old to be eligible for the NRHP, but those that have achieved significance within the past 50 years may be eligible under Criteria Consideration G, which states that a property achieving significance within the last 50 years can be eligible if it is of exceptional importance.

In addition to meeting one or more of these criteria, a resource must retain integrity to be considered a historic property. Integrity is the authenticity of the physical identity, as evidenced by the survival of characteristics that existed during the resource's period of significance. Historic properties must retain enough of their historic character or appearance to be recognizable and to convey the reasons for their significance. The seven aspects of integrity, presented in 36 CFR 60, are location, design, setting, materials, workmanship, feeling, and association. A resource that has lost its historic character or appearance and is not eligible for the NRHP still might have sufficient integrity for the California Register of Historical Resources (CRHR), if it maintains the potential to yield significant scientific or historic information or specific data.

The CRHR is used as a guide by state and local agencies, private groups, and citizens to identify state historical resources and to decide which properties are to be protected, to the extent prudent and feasible, from substantial adverse change. The CRHR, as instituted by the California Public Resources Code, automatically includes those California properties already listed in the NRHP. It also includes those formally determined to be eligible for listing in the NRHP (Categories 1 and 2 in the State Inventory of Historical Resources), as well as specific listings of State Historical Landmarks and State Points of Historical Interest. The CRHR also might include other types of historical resources that meet the criteria for eligibility, including the following:

- Individual historic resources
- Resources that contribute to a historic district
- Resources identified as significant in historic resource surveys
- Resources with a significance rating of Category 3 through Category 5 in the State Inventory (Categories 3 and 4 refer to potential eligibility for the NRHP; Category 5 indicates a property with local significance)

The CRHR follows the lead of the NRHP in using the general 50-year threshold. A resource usually is considered for its historic significance after it reaches the age of 50 years. This threshold is not absolute, but was selected as a reasonable span of time after which a professional evaluation of historic value or importance can be made.

1.3 Area of Potential Effects

The APE for historic properties includes approximately 198.3 ha (490 acres), including 182.6 ha (451.2 acres) of NASA-administered property; 16.9 ha (41.7 acres) in Area I, and 165.7 ha (409.5 acres) in Area II (Figure 2). An additional 15.7 ha (39 acres) of Boeing property are included in the APE, because these areas likely would be part of NASA's cleanup activities. The APE is the area in which the direct and indirect effects of a project may cause alterations to the character of historic properties. The APE for this project was developed in consultation with the State Historic Preservation Officer (SHPO). It incorporates the entirety of the NASA-administered property in LOX Plant Area I and Area II, as well as a few areas outside those boundaries that likely will need to be remediated as a part of the environmental cleanup.

NASA initiated NHPA Section 106 consultation with the California SHPO and the Advisory Council on Historic Preservation (ACHP) on June 30, 2011. This letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. The APE for this project was developed in consultation with the SHPO in 2011 and 2012. Consulting parties received the APE in May 2012 and were afforded the opportunity to comment on the APE for this undertaking.

1.4 Sacred Sites

In December 2012, NASA received notice from the federally recognized Santa Ynez Band of Chumash Indians (Santa Ynez) of the tribe's designation of the NASA portion of SSFL as an Indian sacred site, in accordance with Executive Order (EO) 13007 (*Federal Register*, 1996). The EO aims to "protect and preserve Indian religious practices" and states that agencies managing federal lands shall:

- (1) Accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and
- (2) Avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites (*Federal Register*, 1996).

The definition of an Indian "Sacred Site" according to the EO is:

Any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site" (Federal Register, 1996).

NASA continues consultation with the Santa Ynez regarding the Proposed Action and the potential impacts to the designated Indian Sacred Site, as well as appropriate mitigation measures to address impacts to the Sacred Site. This is a confidential process.

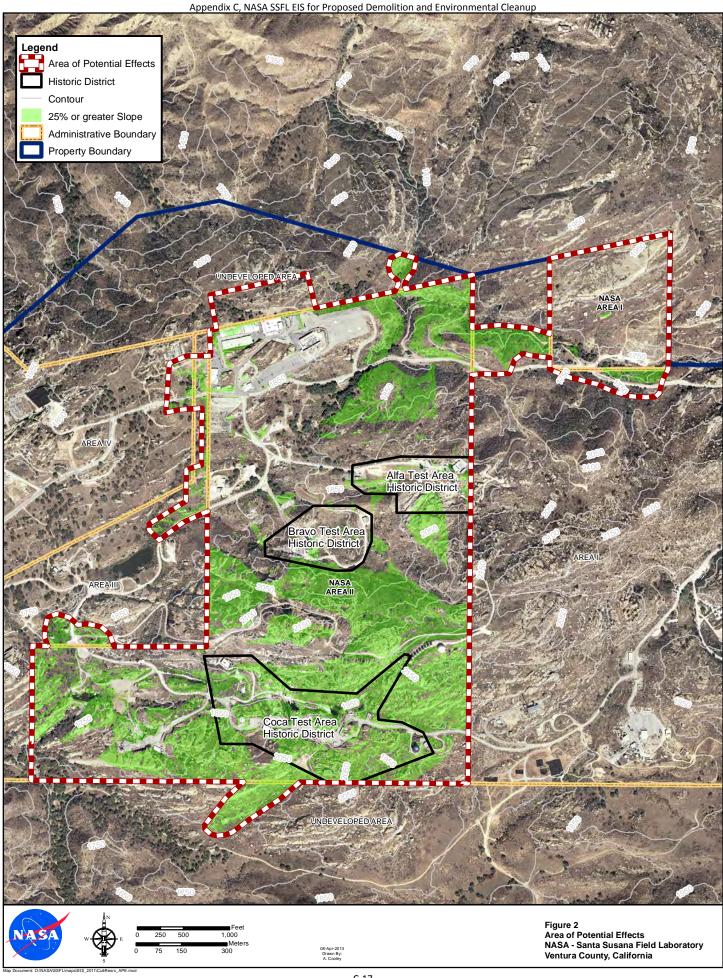
1.5 Traditional Cultural Properties

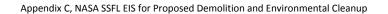
The following definition is adapted from the *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (National Park Service [NPS], 1998): Traditional Cultural Properties (TCPs) consist of sites that have significance in beliefs, customs, and practices with a living community of people that have been passed down through the generations, usually orally or through custom. Traditional use properties can include cultural use areas such as harvesting sites, cemeteries, or religious sites, and their significance is derived from the role the property plays in the community's historically rooted beliefs, customs, and practices.

A preliminary Traditional Cultural Property and Cultural Landscape Assessment has been completed. This assessment includes an investigation and evaluation of the existence and extent of a potential Traditional Cultural Property together with an assessment of a potential cultural landscape. Individuals with knowledge of the region conducted the assessment, which included interviews with local, state, and national tribes. For the purposes of the EIS analysis, NASA has assumed a TCP to exist that meets the criteria of the NRHP and encompasses the entire APE. The TCP assessment report is confidential and is not attached to this report.

1.6 Cultural Flora and Fauna

NASA submitted the SSFL 2011 biological inventory of species identified during the 2010 and 2011 biological surveys to the Santa Ynez for input regarding historically used flora and fauna found on SSFL. Six plants and five animals were identified by the Santa Ynez as having known cultural uses by the tribe. Table 1 lists these species, along with the noted cultural uses. The Traditional Cultural Properties and Cultural Landscape Assessment investigation identified additional flora and fauna historically used by Native Americans in the region.





This page intentionally left blank.

TABLE 1
Flora and Fauna with Recognized Native American Cultural Uses
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Species Name	Common Name	Cultural Use
Flora Species		
Asclepias eriocarpa	Broad leaved Milkweed, Jumete sp.	Culturally recognized for material culture use and ceremonial use; currently used
Asclepias fascicularis	Narrow leaved Milkweed, Jumete sp.	Culturally recognized for material culture use and ceremonial use; currently used
Amsinckia menziesii	Common Fiddleneck	Culturally recognized as a food source and ceremonial use
Marah macrocarpus	Wild cucumber, Manroot, Chilicote sp.	Culturally recognized for material culture use, medicinal, edible and ceremonial use; currently used
Quercus agrifolia.	Coast Live Oak, Encino sp.	Culturally recognized as a staple food source and ceremonial use; currently used
Salvia columbariae	Chia Sage, Chia sp.	Culturally recognized as a food source and ceremonial use; currently used
Fauna Species		
Phrynosoma blainvillii, Anota coronatum	Coast Horned Lizard	Culturally recognized in song and ceremony
Melanderpes formicivorus	Acorn woodpecker	Culturally recognized in oral tradition and ceremonially recognized
Corvus brachyrhynchos	American Crow	Culturally recognized in oral tradition, song, and ceremony
Corvus corax	Common Raven	Culturally recognized in oral tradition and ceremonially recognized
Geococcyzus californianus	Greater Roadrunner	Culturally recognized in oral tradition and ceremonially recognized

Source: Santa Ynez Band of Chumash Mission Indians (2011)



This page intentionally left blank.

SECTION 2

Setting

2.1 Environmental Setting

SSFL is in southeastern Ventura County near the crest of the Simi Hills between the Simi and San Fernando Valleys. SSFL is bordered by Bell Canyon to the south and Meier and Runkle Canyons to the northwest. The Simi Hills are part of the Santa Monica Mountains, which run east-west across Southern California and form part of the California Coast Range of the Pacific Mountain System physiographic region. The mountains consist mainly of late-middle to early Tertiary sedimentary rocks (8 to 70 million years old). The mountains are low in elevation, which results in mild, rainy winters and warm, dry summers.

The elevation ranges from 503 to 663 meters (m) (1,650 to 2,175 ft) above mean sea level (amsl) in the APE, which consists of a diverse terrain of ridges, canyons, and sandstone rock outcrops (Figures 3 and 4). The geology of the area is composed of the Chatsworth Formation, which consists of sediments that range from hard sandstone bedrock to clay, shale, and crushed sandstone; topsoils are alluvially deposited sand, silt, and clay from erosional processes. Vegetation includes Venturan coastal sage scrub, chaparral, annual grasses, oak woodland, southern coast live oak riparian forest, and non-native eucalyptus. The banks of ephemeral streams also are lined with sycamores. Native animals in the area include mule deer, bobcats, mountain lions, coyotes, gray foxes, turkey vultures, hawks, California quail, and ring-tailed cats.



FIGURE 3 NASA Area I Overview October 2011

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II



FIGURE 4

NASA Area II Overview

October 2011

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

2.2 Cultural Context

Abundant evidence exists that humans were present in North America for at least the past 11,500 years. In addition, fragmentary, but growing, evidence exists that humans were present long before that date. Linguistic and genetic studies suggest that human colonization of North America may have occurred 20,000 to 40,000 years ago. Evidence of this earlier occupation is not yet conclusive, but is beginning to be accepted by archeologists. The Meadowcroft Rock Shelter in Pennsylvania, Saltville and Cactus Hill in Virginia, and the Topper site in South Carolina, for instance, are sites that have produced apparently reliable dates as early as 12,500 years before present (Goodyear, 2005).

Ancient sites are known in southern California. In January 1936, Work Projects Administration workers digging a storm drain along the Los Angeles River (north of Baldwin Hills) recovered human bones from an ancient streambed (Moratto, 1984). In March 1936, imperial mammoth teeth were exposed at the same depth as the human remains (Moratto, 1984:53). The next oldest site in southern California where both human skeletal remains and artifacts occur is the La Brea Tar Pits (CA-LAN-159). The Arlington Spring site on Santa Rosa Island has provided occupation dates as early as 13,000 years ago; the discovery of Arlington Spring Man is the second find in North America that has dated to this period (NPS, 2012). Evidence for Paleo-Indian occupation in California exists, but particularly along the coast of southern California, remains scanty (Byrd and Raab, 2007).

The general trend throughout California prehistory was an increase in population density over time, coupled with greater sedentism and the use of a greater diversity of food resources. Chartkoff and Chartkoff (1984) identified three major periods of prehistory observed throughout California: Pre-Archaic, Archaic, and Pacific. These patterns are roughly correlated with the Paleoindian, Archaic, and Emergent periods developed by Fredrickson (1984) for north coastal California. Southern California has had multiple proposed chronological sequences, but no overall accepted model exists. The lack of an unchallenged and accepted chronology is due to problems dealing with gaps in the archeological record such as the unavailability of continuous dateable materials, inconsistencies

in the data and their recordation, and a lack of cultural elements that are definitive of a temporal period or a specific cultural group.

To obtain prehistoric chronologies, group territories, and hallmarks of cultural periods, adaptations from other regions, cultures, and studies have been synthesized to create a chronological overview for prehistoric southern California.

The following chronology is based on Byrd and Raab's updated synthesis of the southern bight cultures, a region that encompasses the California coast from Point Conception in the north to the American/Mexican border in the south and that includes the project area (2007).

2.2.1 Early Holocene (9,600 cal B.C. to 5,600 cal B.C.)

The first groups to inhabit California (for which there is significant evidence) are described as hunters and gatherers with specialized bifacial projectile points, well-made scrapers, knives, and many other tools designed for subsistence-related tasks (food processing). They adapted to a number of environments and developed a variety of secondary subsistence strategies that enabled them to live in a changing environment (Pleistocene to Holocene). As the (Wisconsin) Ice Age ended, previously stable water sources began to dry up in inland California, prompting migrations to the coast. California's islands were occupied as early as 9,600 to 9,000 (calibrated) B.C., as indicated by the oldest levels at Daisy Cave on San Miguel Island. Southern California dwellers exploited a wider range of plants and animals and the archeological record shows that a greater emphasis was placed on gathering wild grasses and seeds, rather than on hunting large mammals. Groups with coastal territories used marine resources such as shellfish, fish, sea lions, and dolphins. Shell midden sites of the early Holocene are characterized by cobble tools, basin metates, manos, discoids, and flexed burials (Byrd and Raab, 2007).

2.2.2 Middle Holocene (6,000 cal B.C. to cal A.D. 500)

At the start of the Middle Holocene, millingstone cultures appeared throughout central and southern California. The Millingstone Horizon represents an adaptive subsistence shift indicated by the first occurrence of millingstones (mano and metate), which were used to process hard seeds like *Salvia* sp. (sages) and *Eriogonum fasciculatum* (wild buckwheat). Sites from this period are characterized by the majority of artifacts being manos and metates, suggesting the importance of vegetal resources. Most of these sites are located in grassland and sagebrush communities where these hard seeds could support small populations on a yearly basis. Late fall and winter were difficult seasons when vegetal foods were scarce and diets had to be supplemented with deer and small mammal hunting and shellfish collecting (Tartaglia, 1976).

Middle Holocene cultures were quite diverse. Large middle Holocene sites have been well documented along the coast, as well as inland. Archeological evidence of extensive trade networks between southern California and the Southwest has been found. Rare artifact types, including the marine purple olive shell, indicate that trade networks extending from Catalina Island through the Mojave Desert and into Oregon were extant in the Middle Holocene (Byrd and Raab, 2007).

Temporary settlements for a few nuclear families (10 to 25 individuals) have been recorded. These sites were seasonal campsites for exploiting yucca and acorns from April through September. The seasonal pattern has been documented as a regional variation in the Millingstone Horizon sites in southern California (King, 1967). These sites are characterized by plant processing tools (scraper planes, millingstones, and earth ovens—necessary to prepare yucca—and an absence of hunting implements. People intensively exploited their environment, with reliance on no particular food resource. Characteristic features of this period included crude chopping tools, large projectile points, manos and metates, *Olivella* shell beads, quartz crystals and cog stones, few ornaments, earth roasting pits, extended posture burials, reburials (secondary interment), and rock cairns (Wallace, 1955:219-221). The first evidence of cemeteries is recorded during this period, and based on the relative absence of non-utilitarian artifacts; an egalitarian social system was likely to have been in operation (Tartaglia, 1976). Recent evidence indicates that the first permanent villages may have been erected during the Middle Holocene on San Clemente Island (Byrd and Raab, 2007). The presence of daub at Middle Holocene coastal sites indicates that at least some of the villages along the coast likely had permanent structures (Strudwick, 2005).

Sites in southern coastal California, specifically within the southern bight region, associated with this period are Little Sycamore Shellmound (CA-VEN-1) and Glen Annie Canyon Site (CA-SBA-142).

2.2.3 Late Holocene (cal A.D. 500 to Historic Contact)

The Late Holocene is characterized by a larger number of more specialized and diversified sites. Population increased substantially and is reflected in a greater number of sites recorded during this time. This period is characterized by (Wallace, 1955:223-226) large village sites, tightly flexed burials, bow and arrow, arrowshaft straighteners, *ollas* (jars) and *comals* (cooking flats), personal ornaments, pottery vessels, circular shell fishhooks, an extensive trade network, a wide variety of ritual objects, and large stone bowls. Elaborate mortuary artifacts are recovered from sites of this period.

Villages occurred in the same general locations as they did in earlier periods, but increased in size and decreased in frequency; base camps often were associated with villages. There was also an increase in the number of specialized and/or diversified sites. Trade was extensive during this period and long distances are reflected in artifacts recovered from the American Southwest (pottery) in California sites, while steatite objects and Pacific Coast seashells occur in American Southwest sites. During the Late Period, many more classes of artifacts are found in the archeological record that reveal a higher order of workmanship. Larger and more extensive settlement systems are evident, likely a byproduct of a more intensive subsistence base exploiting all the available food resources. The bow and arrow was introduced, along with other aspects of the culture being expanded (population growth and more complex social system and trade network).

New studies indicate that culture change in southern California may have been rapid, rather than gradual. Overexploitation of resources may have caused shifts to new resources that occurred in greater amounts (Byrd and Raab, 2007). On the coast, intensified fishing and small sea mammal hunting replaced hunting of large sea mammals and shellfish collection. Fish resources were concentrated on smaller, near-shore species, rather than on deep sea resources. Vegetal resources focused on grasses rather than acorns and direct evidence for acorn use is minimal at Late Holocene sites. Changes in subsistence strategies in prehistoric California appear to be related to overexploitation of preferred resources, leading to a shortage of the desired resource, followed by shifts to more costly resources (Byrd and Raab, 2007).

Several NRHP listed sites have been recorded in the immediate region, including

2.3 Ethnohistory

SSFL is prehistorically and historically within a territory transitional zone for three Native American groups (the Ventureño Chumash, the Tataviam, and the Fernandeño); documentation as well as tribal oral histories indicate that the three groups visited the SSFL locale to some degree (NASA, 2009).

The prehistoric site known as Burro Flats Painted Cave was occupied at the very least from A.D. 1100 through 1810 to 1820 (Emmick and Bard, 2008; NASA, 2009). This site has been associated with the Chumash of Simi Valley and Simi Hills and the Fernandeño of the San Fernando Valley. The Tataviam, who may have occupied areas near Burro Flats, may also claim a connection with Burro Flats (Emmick and Bard, 2008; King, 2012; Knight, 2012; NASA, 2009). Burro Flats Painted Cave is a prehistoric archeological site in Area II that also extends into Boeing-managed undeveloped lands. This site is famous for its many panels of pictographs, or rock art paintings, and petroglyphs, which are rock art that has been scored or incised into the rock surface, in sandstone rock shelters. It also includes many bedrock milling features that may have been used for grinding acorns and smaller cupules that may have been used for processing food or pigments or served an aesthetic function. Much of the site consists of midden, which is debris associated with human habitation. While documenting the middens at the site, Rozaire (1959; 1960a) noted that the midden consisted of debitage, burned bone, and shell fragments. Rozaire also excavated a cremation burial that revealed a mortuary practice used by the Fernandeño. Recent analysis of the artifact assemblage recovered from the excavation investigations has provided occupation dates that now state occupation of this site has been ongoing for approximately 5,000 years (King, 2012).

During late prehistory and into ethnohistoric times, two known Native American villages were near SSFL—the settlement of Huwam (likely Chumash), also known as El Escorpion (Spanish), and Hukxa'oynga' (Fernandeño).

2.3.1 Chumash

The Chumash occupied the territory between Point Conception and Malibu, including three of the Channel Islands. This span of territory afforded the Chumash large trade networks that webbed into central California (King, 1971). The Chumash economic activities produced great wealth and possibly allowed for population increase; the largest villages of the pre-contact Chumash reportedly contained a thousand members (Moratto, 1984).

The Chumash were a maritime people who exploited all coastal resources with accomplishment. Like all maritime cultures, successful marine resource procurement was heavily dependent on the seaworthiness of fishing vessels; the Chumash were master plank canoe, or *tomol*, builders (Gamble, 2002). Plank canoe building is credited with establishing the sociopolitical power the Chumash held amongst their neighbors, with the exception of the Gabrieleño, who also were a maritime culture and seem to have been sociopolitical equals to the Chumash (Gamble, 2002; McCawley, 1996). Along with marine resource procurement, control of waterways provided the Chumash with a command of transportation and goods distribution to the interior, resulting in the Chumash controlling various trade networks (Gamble, 2002).

The Chumash society was composed of multiple bands or tribelets who followed a patrilinear social system. As with their Gabrieleño neighbors, the Chumash had a strict socio-economic hierarchy made up of elites and non-elites; only the chief could have multiple wives (Fages, 1775; McCawley, 1996). It is theorized that there was an inter-dependent relationship between those who specialized in craft production and the elites, who managed the distribution of goods (Arnold, 2004). Chester King (1971) reports that the Chumash controlled a widespread market economy in which standardized production of goods provided highly saleable materials.

Like most hunter-gatherers, the Chumash moved seasonally, primarily in the summer, to optimize their resources. It is reported that they kept permanent winter villages, confining the seasonal camps to temporary occupancy during resource procurement, harvesting, and hunting (Arnold, 2004; King, 1971). Subsistence patterns appear to be similar to those of the Gabrieleño (Arnold, 2004; Gamble, 2002; McCawley; 1996).

At the time of Missionization, baptismal records indicate an average population of 90 members per village and reports by Fages (1775) estimate a total of 3,000 Chumash at the time of contact. However, a Chumash village survey by Kroeber documented 41 villages on the coast and 25 villages in the interior; the survey results yielded population estimates at more than 10,000 members (Cooke, 1976).

2.3.2 Fernandeño

Prior to the establishment of the mission in southern California, the area in and around Los Angeles was primarily occupied by several villages whose residents spoke a Cupan language that belonged to the Takic sub-family of the Uto-Aztecan language stock. Overall, the language was eventually referred to as Gabrieleño, so named after the Mission San Gabriel. This language was actually represented by several sub-groups, and likely several dialects between different villages (Bean and Smith, 1978). Kroeber (1925) groups the Fernandeño language with the Gabrieleño and San Nicoleño languages. The Fernandeño are named after the Mission San Fernando del Rey, where area tribes were relocated shortly after European control was established. The Fernandeño referred to the Gabrieleño as komítáhat, which translates to "the people of San Gabriel" (Harrington 1986: Reel 106). Thus, Fernandeño appear to be distinct, albeit related to the Gabrieleño. Harrington's informant, Juan Menendez, noted that although there are differences in the Fernandeño and Gabrieleño languages, the two were quite similar (Harrington, 1986). The territory of the Fernandeño included inland valleys and coastal plains. According to Menendez, the Fernandeño held the Tujunga and Mujunga mountains (Harrington, 1986: Reel 106). Pre-European contact population numbers are difficult to assess due to discrepancies in the record. In 1852, a Scottish-born Los Angeleno, Hugo Reid, who had married a Gabrieleño woman, published a series of letters about the Gabrieleño. Reid believed there were as many as 68 villages. Twenty-eight of these were in Los Angeles County (McCawley, 1996:25) and some of these villages were likely Fernandeño villages. Each village was reported to have contained an average of 100 people and McCawley (1996) offers an estimate of more than 5,000

Gabrieleños at the time of contact. Kroeber (1925) offers the estimate of approximately 5,000 Gabrieleños in 1770, including the Fernandeño and the San Nicoleño. Writing in the early 1900s, Kroeber (1925) did not distinguish between customs and lifeways of the Gabrieleño and the Fernandeño. The pre-contact Gabrieleño practiced a patrilinear lineage system. Members of the lineage were given access to diverse resources held by the families within their lineage, allowing the Gabrieleño to utilize multiple ecologies. The heavily hierarchical Gabrieleño social system included elites, commoners, middle-class, the poor, and slaves. The elites were the only ones to possess access to religious items and the middle-class supported the elites.

Within Gabrieleño territory, which was composed of coastal areas, islands, valleys, and foothills, there was a patterning to larger settlements; the archeological record provides data regarding large village site distribution and function. Villages were placed where there was access to varying types of environments and resources, and a system of satellite camps stemming from main villages was then established for the specific procurement of resources. The level of use of these satellite campsites was in direct response to population and village size, as well as distance from the main village to the campsite (Earle and O'Neal, 1994).

Subsistence strategies incorporated seasonal procurement of resources, both terrestrial and marine. Throughout the year, individual families would move to temporary encampments for hunting, harvesting, and collecting; depending on the season and resources that could be harvested, travel would occur through various ecological zones. In the interior, where primary habitation was thought to take place in the summers, deer and rabbit were significant resources for the Gabrieleño, who were expert hunters (McCawley, 1996). In spring and summer temporary camps would be established to gather roots, seeds, and bulbs; in the fall, acorns and other wild seeds were gathered as staples in the diet. In coastal areas that were less exposed to the elements, wintertime villages were occupied; satellite or temporary campsites would be erected near the shore to collect shellfish and other marine resources.

2.3.3 Tataviam

The Tataviam spoke a language of the Takic branch of Uto-Aztecan stock (Native-Languages, 2009). Documentation is limited, but it is believed that the Tataviam migrated into the region approximately 1,500 years ago and were possibly an offshoot of the Serrano, although there is some debate on this point. The Tataviam occupied a territory that spanned from the Santa Clarita River to Piru Creek and from the Sawmill Mountains to the Antelope Valley (Higgins, 1996; Digital Desert, 2011).

The Tataviam were hunter-gatherers and, like their Chumash neighbors, had permanent winter villages and seasonal temporary campsites used for resource gathering of plant foods such as acorns, seeds, berries, yucca, piñon nuts, and for hunting deer and rabbit (Los Angeles County, 2008). Village location, whether permanent or satellite, was dictated by availability to water, favoring more reliable and permanent sources such as springs, rivers, and lakes (Los Angeles County, 2008). Household structures were composed of circular pit-houses with willow poles to shape the structure, which then were covered by grasses. Villages were placed on the southern sides of hills and mountains to optimize exposure to sunlight (California State Parks, 2011). Large villages contained dance and gaming areas, cemeteries, sweat lodges, granaries, and specialization areas, much like their neighbors.

Of the three groups who occupied the project area in pre-contact times, the Tataviam are the least known of all Native California groups (Johnson, 2006; Los Angeles County, 2008). The written information that survives references the Tataviam in generalizations and comparisons to their neighbors. Population estimates are at less than 3,000 at time of contact, but there is no feasible manner to accurately verify that information. When it comes to population estimates at the time of contact by Europeans, these numbers are approximations and no reliable data exist (Johnson, 2006). Little was recorded about the Tataviam culture during Spanish exploration and later missionization in the 1770s; what does survive of the native language was documented by John Peabody Harrington in the early 1900s. Mission records and other historical documents often failed to distinguish the Tataviam as an individual group when multiple tribes and languages where encountered; often ethnic affiliation was not distinguished or commented upon. Many of the Tataviam were relocated to the San Fernando Mission during historic times and were assimilated with other groups into an indistinct neophyte culture. The Tataviam

language is no longer in use because there are no current Tataviam members who speak the native language. The last speaker died in 1916 (Native-Languages, 2009; University of California, 2011).

2.4 History

Generally, the historic period begins with the first documented entrance by a European into a specific region. However, due to known contact in other parts of California by Russians, Chinese, Spanish, and Portuguese, some chronologies terminate the late prehistoric for all California in 1542, when the first documented European entered the territory now known as California; this period is termed the Protohistoric Period. In 1542, Juan Rodriguez Cabrillo explored the California coast by ship, entering San Diego Bay and claiming Alta California for Spain. Cabrillo landed near Point Magu in the same year. Sixty years later, Sebastian Vizcaino sailed into the San Diego Bay. Exploration of the land was slower to come. Don Gaspar de Portola searched Alta California for suitable mission sites in 1769.

In California, the historic era generally is divided into three periods: the Spanish or Mission Period (1769 to 1834), the Mexican or Rancho Period (1821 to 1848), and the American Period (1848 to present).

2.4.1 Spanish/Mission Period (1769 to 1834)

Gaspar de Portola was appointed as the first governor of California in 1767 and his first command by the Viceroy of Mexico was to expel the Jesuits from Baja California. This action prompted the launch of military and Franciscan expeditions from Baja California into the region, and with it, the official start of the historic period in California began. Following the expulsion of the Jesuits in Baja California, Spanish Colonial military outposts were established in Alta, the first of which was El Presidio Real de San Diego in 1769, with Pedro Fages as its commander. Military outposts continued to be built as expeditions travelled north. The Portola expedition of 1769 reached what would become Orange County on July 22, was in the San Gabriel Valley by August 2, and was passing through what would become Ventura County by the end of that month (Beebe and Senkewicz, 2001).

This period introduced the era of Missionization, an era of forced conversion of the Native Americans who occupied the region. During this period, 21 missions were built in California, lined up from south to north along El Camino Real; contemporary Highway 101 follows roughly the same alignment as El Camino Real. The first mission to be built in Alta California was San Diego de Alcala, founded by Father Junipero Serra on July 16, 1769. On March 31, 1782, Father Serra founded his last mission, the Mission San Buenaventura (San Buenaventura Mission, 2006). Mission Santa Barbara, the tenth mission to be established, was founded in December 1786 by the Franciscan Father Fermin Lasuen (California Missions Foundation, 2008). The Franciscans viewed the local population as child-like individuals who would benefit from their European instruction and Christianization (We Are California, 2011). Captured and removed from their villages, the indigenous peoples were brought to the missions and into servitude. Many perished due to ill treatment, but more from the introduction of European diseases, which ultimately decimated the Native American populations (McCawley, 1996; We Are California, 2011).

In the 1790s, the Spanish government awarded land grants to soldiers and other Spanish *Californios* (Ventura Weekly, 2005); vast tracts of land were used for livestock and farming. In 1795, the Pico family was granted 45,729.6 ha (113,000 acres) in the area now known as Simi Valley; the *rancho* was named El Rancho Simi (Simi History, 2011.). The name Simi was taken from the Chumash village name of *Shimiji*, which stood in the same location in pre-colonial times.

The last mission to be founded was San Francisco Solano in 1823. Further attempts to construct additional missions were thwarted by Spain itself due to the costly endeavor each new mission posed. Later, as Spain lost its rule over New Spain and secularization was sought by the new government, the mission system was disbanded (Weber, 2006).

2.4.2 Rancho Period (1821 to 1848)

Mexico became independent of Spain in 1821. In 1824, the Mexican government passed the Colonization Act in an effort to raise much needed funds by selling unoccupied lands in California. This law invited immigrants to settle in Mexico (including California) (Baker, 2013). However, much of the land in California belonged to the 21

missions and could not be sold by the new Mexican government. Through the Secularization Act of 1834, the governor secularized the missions of California, and the Mission land was placed under civil jurisdiction to be sold as land grants. This Act relegated the missions to only enough acreage for the church and its associated buildings and for land to support those who lived on mission property. The Secularization Act of 1834 effectively ended the Mission Period in California.

The following years were marked by the proliferation of cattle ranching throughout the region, as the Mexican governor, Pio Pico, granted vast tracts of land to Mexican (and some American) settlers. The mission lands were opened for grants by the Mexican government to citizens who would colonize the area and develop the land, generally for grazing cattle and sheep (Lech, 2004). In Ventura County, there were 19 ranchos, comprising thousands of acres of land each (Galvin Preservation Associates, 2011).

In 1842, Jose de la Guerra y Noriega acquired the Pico family's Rancho Simi (California State Military Museum, n.d.). De la Guerra y Noriega was one of the most prolific landowners and claimed more than 202,343 ha (500,000 acres), with ownership of land that extended from the southern end of San Luis Obispo County to the southern end of Ventura County (California State Military Museum, n.d.).

The war between the U.S. and Mexico, which began in 1846, ended with the Treaty of Guadalupe Hidalgo in 1848. Terms of the treaty established that property rights granted under the Mexican land grant system would be upheld. In 1850, California became a part of the U.S., ending Mexican control in the state. Court battles ensued over ownership of the missions and former mission property that had been divided into Mexican land grants (NPS, 2007).

2.4.3 American Period (1848 to Present)

Following the signing of the Treaty of Guadalupe Hidalgo in 1848, the U.S. took possession of California. The treaty bound the U.S. to honor the legitimate land claims of Mexican citizens residing in captured territories. On September 9, 1850, California became the thirty-first state in the Union (Moratto and Price, 2005). The Land Act of 1851 established a board of Land Commissioners to review these records and adjudicate claims, and charged the Surveyor General with surveying confirmed land grants. In order to investigate and confirm titles of California, American officials acquired the provincial records of the Spanish and Mexican governments that were located in Monterey. Those records, most of which were transferred to the U.S. Surveyor General's Office in San Francisco, included land deeds and sketch maps (Gutierrez and Orsi, 1998).

From 1852 to 1856, the board of Land Commissioners established the validity of grant claims. The commissioners rejected many of the original *rancho* claims, which then became public domain and fair game for squatters. Although the claims of some owners eventually were substantiated, many of the original owners lost their land to the U.S. Unsurveyed land boundaries created a loophole for squatters to occupy plots on the fringes of land grants. The squatters who occupied the land eventually came to own those plots through squatters' rights (Gutierrez and Orsi, 1998).

In the 1860s, Rancho Simi passed to the Philadelphia and California Petroleum Company and, in 1887, it was parceled off and a portion was bought by the Simi Land and Water Company. The general area around former Rancho Simi became a town known as the Santa Susana Del Rancho Simi (Simi History, 2011.). By the end of the nineteenth century, a portion of the Rancho Simi adobe was still intact. The landowner, Robert Strathearn, restored the building and built onto the original structure; the Simi Adobe-Strathearn House is California Historic Landmark No. 979 and is listed in the NRHP.

Into the 1940s, the area on which SSFL is located was still used for ranching (NASA, 2009). After World War II, North American Aviation (NAA) purchased land that would be developed for rocket testing. In 1954, NAA purchased 339 ha (838 acres) from Henry Silvernale and Elizabeth Hall, which would later become part of NASA's Areas I and II (NASA, 2011).

2.4.4 Santa Susana Field Laboratory

The following is a brief summary of the detailed history of SSFL provided in the SSFL ICRMP (NASA, 2009) and the Historic Resources Survey and Assessment at SSFL (Archaeological Consultants, Inc. & Weitze Research [ACI and WR], 2009).

By the end of World War II, the Cold War had begun. This was a war fraught with political tension and a maintained military presence between the U.S. and its western allies and the Soviet Union and its allies; it would run from post-World War II (mid 1940s) through the early 1990s. The Cold War would be the catalyst for the missile program and other space developments to unfold.

In 1946, the U.S. Army, along with NAA, began to develop the Navaho guided missile. Following this contract between the two agencies, NAA began to test captured German missiles at the White Sands Proving Ground. Also, in the late 1940s, the U.S. Government and NAA had acquired the SSFL land and began research, development, and testing of liquid-fueled rocket engines. SSFL was divided into four management areas: Areas I, II, and III were reserved for rocket, munitions, and missile testing; Area IV was dedicated to nuclear power and development. Expansion of SSFL and rocket testing briefly was put on hold during the Korean War, resuming after the war with an increased demand.

The Rocket Engine Field Laboratory was built in the 1950s; in 1954, additional areas were developed for U.S. Department of Defense (DoD) programs and the Alfa, Bravo, Coca, and Delta test stands were constructed. In collaboration with NAA, the USAF established two Air Force Plants (AFPs) within the expanded SSFL acreage; these were managed as government-owned contractor-operated facilities. In 1956, the Rocket Engine Field Laboratory became known as the Propulsion Field Laboratory, and in 1957, it was changed to AFP 57, after the USAF took over the test facility.

SSFL became a renowned research and test facility and provided pivotal developments in rocket testing, weapons, and space travel; this included the Redstone rocket, the Apollo program, Atlas intercontinental ballistic missile; the USAF, Army, and NASA conducted testing at SSFL. In addition to the Navaho, Thor, and Atlas testings, Rocketdyne engineers also tested the Jupiter intermediate-range ballistic missile. The test stands for the missiles were distributed among the Alfa, Bravo, Coca, and Delta test stands; the ICRMP (NASA, 2009) states the following as the testing allocations:

Alfa test stands: Constructed during 1954-1955, the Alfa test site featured the first cluster of static test stands operational for AFP 57 at SSFL. Beginning in the mid-1950s, the Alfa test site supported early rocket engine static testing and provided pivotal data for the development and improvement of many weapons and space vehicle booster systems; Atlas on Alfa I (1955–1957), Atlas flight engine and Navaho engine on Alfa II (1956–1957), and firings of Thor (1955–1958), Atlas (1956–1957), Navaho (1956–1957), and Jupiter (1957) engines on Alfa III.

Bravo test stands: Constructed during 1955-1956, the Bravo test site featured the second cluster of static test stands operational for AFP 57 at SSFL. The test stand site is associated with multiple static engine tests run between 1956 and 1991, beginning with tests of Atlas thrust chambers in 1956, and also supporting testing of F-1 components, Lunar Module Rocket Engine assemblies, and Atlas and Delta RS-27 vernier engines and turbopumps; Atlas (1956–1957) on Bravo I and II, developmental E-1 engine (1956–1959) on Bravo I, and static firing tests of the RS-2 on Bravo IIIB (1959).

Coca test stands: Constructed in 1955-1956, the Coca test site featured the third cluster of static test stands operational for AFP 57 at SSFL. Some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were designed between 1972 and 1978. The test site is associated with multiple static engine tests run between 1956 and 1988, beginning with tests of Atlas and Navaho engines in the late 1950s; the J-2 engine in the 1960s in support of Saturn

and Apollo; and the Space Shuttle Main Engine in the 1970s and 1980s in support of the Space Shuttle Program; Atlas engine on Coca I and II (1956–1957), Atlas engine on Coca II (1959), and a late version of the Navaho engine on Coca III (1956–1957).

Delta test stands: Constructed in 1956, the Delta test site featured the fourth cluster of static test stands operational for AFP 57 at SSFL; Atlas on Delta III in 1957, static firings of the Jupiter engine on Delta I (1960–1963), and experimental Air Force rocket engines, including firings of the E-1 engine (1958–1960), the X-1 engine (1958–1961), and the X-4 engine (1960) on Delta II. (NASA, 2009)

In addition to these developments, in 1958, the Jupiter C rocket with a Redstone engine took the Explorer I, the first American satellite into orbit; also in 1958, the Saturn I program was started. In 1961, the Mercury capsule, with an adapted Redstone engine, was launched and the Saturn Apollo program was initiated.

The period of major testing at SSFL occurred from 1950 through the 1970s; at the height of the testing during the 1960s, NASA was given to lease the AFP 57 to support the Apollo program. NASA operated many facilities within SSFL, and by 1966, four new structures within the Coca test area were built; modifications to existing structures in the Bravo and Delta test areas also were made.

Planning for the Space Shuttle Main Engine was begun in 1969 and Rocketdyne was chosen to initiate and develop the engine. To support the testing, in 1972, a high-pressure gas storage vault was added to the Coca Test area.

In 1973, Area II and a section of Area I were transferred to NASA from the USAF. Use of the test site areas varied and changed from decade to decade; by the 1980s, NASA had begun to shut down testing activities and only a few active locations continued into the 2000s. The Alfa test area continued to testing of Atlas MA-5 engines until 2000 and the Delta RS-27 and RS-27 until 2006; the Bravo test area continued to test the Delta RS-27 and Atlas until 2005; the Coca test area continued to test the Space Shuttle Main Engine until 1988; the Delta test area continued to test engines until 1974, when it was deactivated.

Today, SSFL is composed of government-owned, contractor-owned/contractor-operated, and corporate enterprise facilities, and facilities operated by the U.S. Department of Energy on land it leases from Boeing. NASA has discontinued rocket testing, and in 2007 and 2010, orders were issued to conduct environmental cleanup of NASA-administered property in LOX Plant Area I and Area II.

SECTION 3

Previous Investigations

3.1 Archival Research

Literature searches were conducted at the South Central Coastal Information Center (SCCIC) at California State University—Fullerton for this project. Literature searches were conducted first in 2006. An updated literature search was conducted on July 12, 2011, for the NASA-administered portion of SSFL (Area I [LOX Plant Area] and Area II); a 1-mile undeveloped area around the NASA-administered property at SSFL was included in this research. A subsequent records search was conducted at SCCIC in December 2012. This literature search included a portion of the Boeing-administered property that may be impacted by the NASA cleanup activities. The literature searches conducted at the SCCIC provided data resulting from previous cultural resources studies within the APE and within a 1-mile buffer around the APE. Data also were provided by NASA regarding previous investigations and previously recorded resources. Table 2 lists previous studies conducted within the APE. The ACI and WR report (2009) was furnished by NASA and, therefore, does not have a California Historical Resources Information System (CHRIS) catalogue number. Multiple cultural resources studies have been conducted within the APE. Table 3 lists previously recorded historic properties within the APE and their NRHP status. Table 4 summarizes previously identified cultural resources within 1 mile of the APE.

TABLE 2

Cultural Resources Studies Previously Conducted within the APE

Cultural Resources Study for Environmental Cleanup and demolition for SSFL, NASA Areas I and II

Report Authors and Date	CHRIS Catalogue Numbers
	<u> </u>
	

TABLE 3
Previously Recorded Historic Properties in the APE

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Site Number	Site Description	NRHP/CRHR
	Burro Flats	Listed
		Potentially Eligible
		Potentially Eligible
Not assigned	Alfa Test Area Historic District	Eligible
Not assigned	Bravo Test Area Historic District	Eligible
Not assigned	Coca Test Area Historic District	Eligible

Notes:

APE = area of potential effects

CRHR = California Register of Historical Resources

NRHP = National Register of Historic Places

Source: CHRIS South Central Coastal Information Center and NASA

TABLE 4

Previously Recorded Resources within 1-mile of the APE

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Site Number	Site Description	NRHP/CRHR

TABLE 4

Previously Recorded Resources within 1-mile of the APE

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Site Number	Site Description	NRHP/CRHR
<u></u>		

Notes:

APE = area of potential effects

CRHR = California Register of Historical Resources

NRHP = National Register of Historic Places

Source: CHRIS South Central Coastal Information Center

3.2 Field Inventory Methodologies

The APE has been subject to multiple episodes of field surveys to locate and document prehistoric, historic, and architectural resources. Archeological field surveys were completed to satisfy both federal and state requirements. Federal requirements for conducting archeological surveys are primarily outlined in Section 106 of

the NHPA and in the Secretary of the Interior's Standards and Guidelines for Identification. California State guidelines are outlined in California Environmental Quality Act of 1970 (CEQA) Public Resources Code Section 5097.2, and CEQA Guidelines Section 15064.5. Archeological survey methodologies were consistent with professional standards and in accordance with common practice for such studies in the state of California.

The first in a series of intensive, systematic pedestrian cultural resource surveys within the APE was conducted in June 2007, followed by another investigation in February 2008 of NASA's LOX Plant Area I and Area II. The findings of these investigations are contained in a single report (Emmick and Bard, 2008). Methodologies for these field investigations employed the use of site records to relocate known resources and mapping using global positioning system (GPS) units. Pedestrian transects alternated between 15 m (49.2 ft) and 30 m (98.4 ft) due to uneven, steeply sloped terrain. All rock outcrops were investigated for use, because rock shelters with evidence of use or occupation are known to occur throughout the Bell Canyon region. This investigation resulted in the collection of additional data at the Burro Flats site and in the discovery of one new site, . As part of this investigation, CH2M HILL revisited the Burro Flats site during pedestrian surveys conducted for Areas II and III (CH2M HILL, 2013). CH2M HILL identified no new features at that time, but did record Universal Transverse Mercator (UTM) coordinates for most of the previously recorded Burro Flats features within the APE. A nearby rock shelter, described in previous site forms, was included in the updated site boundary drawn in 2007. This updated boundary was drawn based on the UTM coordinates taken during the 2007 site visit. California Department of Parks and Recreation (DPR) forms were also completed for the site to report the newly recorded UTM coordinates.

In June 2009, a supplemental survey of approximately 4.9 ha (12 acres) was conducted in the LOX Plant Area I using the same survey methodologies as in the 2007/2008 study (McClintock, et al, 2009); no additional resources were discovered during this investigation. To complete the surface inventory of the APE, an intensive, systematic pedestrian cultural resource survey of an additional 30.4 ha (75 acres) within the NASA-administered property at SSFL was conducted from October 24 through October 28, 2011. NASA arranged for Mr. Randy Guzman-Folkes of R. Indigenous Consultants Tribal Monitoring to be present during the 2011 archeological field survey.

The topography of the APE consists of hilly and rugged terrain. SSFL is located at the crest of the Simi Hills, the foothills to the Santa Monica Mountains. Topographic elevations range from 503 to 663 m (1,650 to 2,175 ft) and SSFL is crossed with ridges, canyons, rocky uplands, deep alluvial channels, drainages, ravines, and washes. Because of the rugged terrain typical throughout the NASA-administered property of SSFL, including severe drops, ravines, and other inaccessible terrain, traditional 15-m (49.2 ft) transects were not feasible in all areas. In low flat areas where pedestrian navigation was feasible, transects spaced at 15-m (49.2-ft) intervals were conducted. Areas with greater than a 25-percent slope (shown in Figure 2, the APE) were surveyed differently as equally spaced transects were not feasible in these greater than a 25 percent slope areas. Therefore, in areas where the slope was greater than 25 percent and the terrain was unsafe for regular pedestrian survey, an opportunistic reconnaissance level survey was employed. Particular attention was given to outcrops and overhangs because known rock shelters are located within Area II (Figures 5 and 6). Subsurface exposures, including rodent burrows and cut banks, were examined carefully for cultural remains. Ground visibility throughout the survey area ranged from 0 to 75 percent because of the dense woodland scrub, a carpeting of poison oak, and other vegetation. Disturbances to the survey area consist of construction and demolition, NASA and Boeing facilities, roads, parking lots, maintenance, utilities, water and erosion control, and test areas with their associated activities.



FIGURE 5

NASA Area II, Example of Vegetation Onsite
October 2011

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

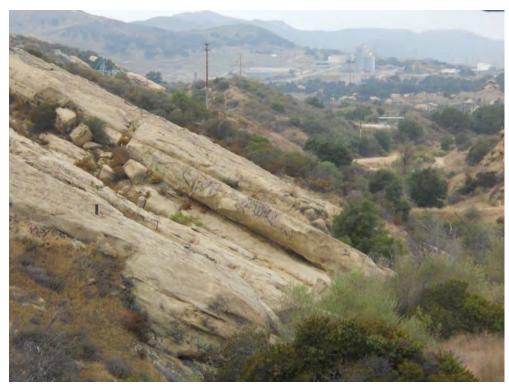


FIGURE 6

NASA Area II Rock Outcrop, an Example of an Opportunistically Surveyed Area

October 2011

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

For the October 2011 archeological survey, the field crew navigated via a Trimble Geo XH GPS unit. The GPS unit contained the survey area shape files, the previously recorded site boundaries, and the previously recorded resources. Appendix A contains representative photographs of the APE from this 2011 survey.

With the completion of the October 2011 survey, 182.5-ha (451.2-acres) of NASA-administered property at SSFL have been investigated for cultural resources. In addition to the 182.5 ha (451.2 acres) of NASA property, 15.7 ha (39 acres) of adjacent Boeing property were surveyed because NASA's cleanup activities likely would extend into these areas.

For the purpose of defining a site, the guidelines provided in the California Office of Historic Preservation's (OHP's) *Information Center Procedural Manual* (1995), which defines a site as the location of a prehistoric or historic occupation or activity, were used. Per this definition, and following OHP guidelines, areas with five or more items are recorded as sites, while areas with four or less items are recorded as Isolated Finds. Features are recorded as sites. Resources separated by more than 50 m (164 ft) or located on different landforms generally are recorded as distinct sites or as isolates.

Cultural resources consisting of new sites and isolated finds were recorded on appropriate California DPR forms, mapped using a Trimble Geo XH GPS, and photographed. Information regarding the appearance and physical characteristics of the resources, as well as their locations, was gathered and included on the appropriate California DPR forms. No artifacts were collected during any episode of survey; they were mapped and photographed in place.

In addition to archeological investigations, NASA-administered properties at SSFL have been surveyed for architectural resources. In 2007, a historic resources survey and assessment of NASA-administered Areas I and II was performed to identify and evaluate NASA-owned facilities. The methodology employed in this study included the following archival research: historic documents and photographs at the Marshall Space Flight Center History Office, Huntsville, Alabama; the Air Force Historical Research Agency, Maxwell Air Force Base, Montgomery, Alabama; the Rocketdyne Historic Photograph Collection at SSFL; the Boeing Company office in Canoga Park, California; and the DMJM office in Los Angeles, California. Interviews with current and former employees of Rocketdyne and Boeing also were conducted as a part of this investigation.

The field survey of buildings and structures in NASA-administered LOX Plant Area I and Area II was conducted from August 13 to 18, 2007, and facilities were documented via description and photography (ACI and WR, 2009). According to the 2009 report, structures within the survey area were evaluated for NRHP-eligibility. As a result of this study, three historic districts were documented: the Alfa, Bravo, and Coca Test Area Historic Districts, as well as nine individually eligible structures (ACI and WR, 2009).

3.3 Results of Previous Investigations

3.3.1 Archeological Resources

3.3.1.1

The Burro Flats site was listed in the NRHP and the CRHR in May 1976. The Burro Flats site was first recorded in 1959 (Rozaire, 1959). At that time, NRHP significance criteria had not been developed. The NRHP website indicates that the site is significant for its informational potential, which today would be Criterion D (NRHP, 2013).





The Burro Flats site could have been visited by John Peabody Harrington as early as 1917 (Harrington, 1986: Reel 106, Fr. 153). Richard Van Valkenburgh, an archeologist working in the area during the 1930s and into the 1950s listed the painted cave and midden site on a map of sites in Ventura County that dated circa 1935 (King and Parsons, 2000). The earliest documented investigations at Burro Flats began in 1953, with excavations carried out by the Archaeological Survey Association of Southern California, which made five trips to the site between 1953 and 1954. The site was formally recorded and limited excavations were completed by Rozaire in 1959 and 1960 (Rozaire, 1959), but only a short article was published. In the 1960s, Campbell Grant visited and recorded the site, publishing information about the rock art in 1965. The site was listed in the NRHP in 1976, largely due to Dr. Clement Meighan from University of California, Los Angeles. In 1991, Albert Knight combined 10 site numbers into one site to clarify that the site is a single village site with multiple loci (Knight, 1991). The site was visited again in 2006 and 2007 by W&S Consultants for the express purpose of cataloguing the condition of the rock art (Whitley, 2007). In 2007, CH2M HILL revisited the site during pedestrian surveys conducted in Areas II and III. CH2M HILL identified no new features at the site, but did record UTM coordinates for most of the features previously recorded at the site on the NASA property. California DPR forms were completed for the site to report the newly recorded UTM coordinates (Emmick and Bard, 2008).

Table 5 lists the sites and loci from previous investigations that were re-recorded and consolidated into the single site

TABLE 5

Rozaire Site #	Knight #	Fenenga #	Description

TABLE 5

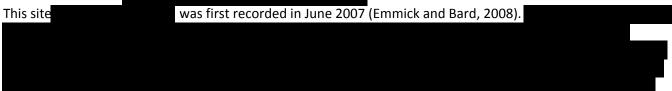
Site Cross-Reference for Site Numbers, Loci, Galleries, and Features

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Rozaire Site #	Knight #	Fenenga #	Description

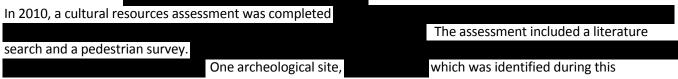
Sources: Rozaire (1959, 1960a-j); Knight (1991a-f); Fenenga (1973); Whitley (2007)





During the initial evaluation of this site, it was deemed to retain integrity of location, design, setting, materials, and workmanship. The site was recommended eligible for listing in the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The California SHPO reviewed this recommendation as part of a Section 110 consultation in February 2009. The SHPO commented that the sparse collection of artifacts and lack of features appeared to indicate that the site had been used only rarely and could represent a single episode of use. SHPO did not concur with the finding that was eligible for listing in the NRHP. SHPO recommended the site be treated as potentially eligible for all undertakings. NASA responded on April 23, 2009, agreeing to treat the site as potentially eligible for listing in the NRHP for any undertakings.





investigation, is sparse lithic scatter and extends a few meters into the current APE.

Much of the ground visibility in the area is limited by thick vegetation.

The site is in good condition and there is a possibility that the site has an intact subsurface component.

Hogan and Tang (2010) state:

The archaeological data potential depends upon the presence or absence of subsurface cultural deposits.

Therefore, their historical significance and qualifications as historical properties under Section 106-cannot be determined without further archaeological investigations, including subsurface testing. (Hogan and Tang, 2010)

Therefore, the site is recommended as potentially eligible for listing in the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The California SHPO has not yet reviewed this recommendation.

3.3.2 Historic Architectural Resources

In the fall of 2007, ACI conducted an assessment survey of the built environment within NASA-administered LOX Plant Area I and Area II of SSFL (ACI and WR, 2009). This survey assessed 135 federally owned buildings, structures, and sites. ACI and WR identified one structure, a well, in Area I, but there is also a truck scale with a small operators shed in Area I, which are owned by Boeing (NASA, 2013). The remaining surveyed structures were all in Area II. The survey results indicated that 60 of the structures within Area II are temporary; small storage sheds, roadways, pipelines, and objects such as light fixture poles that are generic in use. The results of this investigation identified three historic districts—the Alfa, Bravo, and Coca Test Areas—and nine structures within the districts that are considered individually eligible for listing in the NRHP (ACI and WR, 2009).

See the *Historic Resources Survey and Assessment of the NASA Facility at Santa Susana Field Laboratory, Ventura County, California* (ACI and WR, 2009) for a more detailed history of SSFL and the development of each of the historic districts.

3.3.2.1 Alfa Test Area Historic District

The Alfa Test Area Historic District was recorded as part of the historic resource assessment survey conducted in August 2007 (ACI and WR, 2009). The following is paraphrased from that report.

Designed by Daniel, Mann, Johnson & Mendenhall, Inc. (DMJM) in 1954 and constructed between 1954 and 1955, the Alfa engine test site featured the first cluster of static test stands operational for AFP 57 at SSFL. The design and construction of the test site followed the design and construction of two similar test sites at SSFL: the Bowl Area from 1948-1950 and the Canyon Area from 1953, both for NAA. DMJM designed the test stand sites within Area II in stages between August 1954 and April 1956. For Phase I of AFP 57, DMJM designed the Alfa complex, the first of four test-stand clusters that would be constructed in Area II, as well as several basic elements of the support infrastructure necessary for the future expansion of the plant. In 1954, the Alfa site occupied 100 acres, bordering Rocketdyne property on its east (the Bowl and Canyon Areas) and with a 350-ft buffer of USAF land on its west. In September 1954, the Alfa site defined the near entirety of what would evolve into AFP 57 at SSFL (ACI and WR, 2009).

The location of the Alfa site, like that of the Bowl Area, was carefully integrated into the existing natural landscape. Three small engine test stands, each with two platform levels, sat alongside their east-west access road. The test stands stood just under 46 ft high, with a base footprint of 24 ft by 24 ft. NAA designed and fabricated the flame buckets for the test stands, with each emptying southwards via short, manmade concrete flame trenches into an east-west rocky ravine that would become the site's common spillway. The lowest elevation in the ravine was 1900 ft, with Alfa's water tanks situated at nearly 2,200 ft. Additional outcroppings of boulders and rock to the immediate south and southeast also buffered the discharged rocket engine exhaust and deluge water from the test stands, providing blast and sound protection (ACI and WR, 2009).

The Alfa site was distinct from the Bravo, Coca, and Delta sites that would complete Area II of AFP 57 in 1955-1956. Unlike the final three clusters of rocket engine test stands and their support infrastructure, the Alfa site was

stretched out along its access road, with its three test stands and blockhouse configured as a linear group east to west. DMJM designed the control house for the Alfa test site (the blockhouse) as a nearly fully underground facility to the immediate west of the line of test stands. Other original facilities at the Alfa site were a terminal house, electrical control stations at each test stand, pre-test building, electrical switching house (power substation on the ridge north of the immediate Alfa site), and enclaves of fuel system support infrastructure. The fuel tanks and associated pumping equipment were predominantly clustered at a segregated location at the western edge of the site, with much smaller fuel storage and transfer infrastructure placed at the test stands and pre-test building at the eastern end of the site. The fuel system infrastructure to the west included liquid hydrogen (LN2) tanks, GN2 cylinders, a LN2/ gaseous nitrogen (GN2) vaporizer, a hose house, and jet-propulsion fuel (JP4) tanks and their paired pumping station. At the eastern terminus of the Alfa site and immediate to Alfa III sat small, horizontal LOX tanks, small GN2 tanks, and a helium cylinder. A pair of vertical tanks stored water for use in the deluge systems at the three Alfa test stands, located distantly to the south of the pre-test building atop an elevated site. A pipeline carried water from the tanks to the flame buckets of each of the test stands. The water kept engine temperatures acceptable during static tests, partially evaporating as steam and combining with engine exhaust as run-off into the ravine spillway. As initially designed, the Alfa test site did not include observation pill boxes. As initially designed, there were no observation bunkers within the Alfa test area. In 1955-56, during the design of the Bravo site, DMJM provided plans for the addition of a pill box for the Alfa site, located to the southeast of Alfa III. Later, a second observation bunker was built to the southwest of Alfa I (ACI and WR, 2009).

The Alfa test site is highly intact, inclusive of the land forms incorporated into its 1954 design. The primary extant buildings and structures from 1954 at the Alfa test site in 2007 during the survey were test stand Alfa I and its electrical control station (Buildings 727 and 727A), test stand Alfa III and its electrical control station (Buildings 729 and 729A), the control house (Building 208), and the terminal house (Building 209). The pre-test facility also remains at the Alfa site (Building 212), but is substantially altered. As designed and constructed, the pre-test building featured an inexpensive and expeditious cladding of plywood panels with wooden battens (ACI and WR, 2009).

The Alfa Test Area Historic District is eligible for listing in the NRHP under Criterion A for its association with early rocket testing and development and under Criterion C for its engineering and design. The district contains 18 buildings, of which 10 are contributing resources. Constructed during 1954-1955, the Alfa test site featured the first cluster of static test stands operational for AFP 57 at SSFL. Beginning in the mid-1950s, the Alfa test site supported early rocket engine static testing and provided pivotal data for the development and improvement of many weapons and space vehicle booster systems (Criterion A). The Alfa Test Area Historic District is also eligible under Criterion C for the design and engineering of the test site. The district includes the test stands and blockhouse, ancillary buildings and structures, and elements of the natural and fabricated landscape. Within the historic district, 3 of the 10 contributing structures also were determined individually eligible for the NRHP. The Alfa Control House (Building 208), Alfa I Test Stand, and Alfa II Test Stand were documented as each individually meeting the NRHP criteria for eligibility in the context of the Cold War (Military) and Space Exploration, under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because they have achieved exceptional importance within the past 50 years, Criteria Consideration G applies, as well. SHPO concurred on May 15, 2008, with the eligibility of the historic district and its contributing elements, as well as with the individual eligibility of the three structures.

3.3.2.2 Bravo Test Area Historic District

The Bravo Test Area Historic District was surveyed as part of the historic resource assessment conducted in August 2007 (ACI and WR, 2009). The following is paraphrased from that report.

In March 1955, DMJM completed drawings for the second cluster of static test stands, the Bravo site. Design of the Bravo site included the addition of a pill box for the Alfa site (to the southeast, up among the rocky outcroppings); a bunkered Visitors Observation Area to the west of the Alfa site; and a pill box for the Bravo site (to the south). DMJM engineers approached the layout of the Bravo site differently than they had the Alfa site

6 months earlier. At Bravo, the cluster of three test stands and their support facilities was more compact, and faced a large, aboveground control house set off to the side near the foot of a common spillway. Each test stand had manmade flame trenches that emptied into the spillway. The existing rocky terrain climbed steeply behind the test stands to provide an elevated location for the observation of engine testing, while the immediate outcroppings also helped to channel existing natural features incorporated into the spillway. The layout of both the Alfa and Bravo sites remained within the original 100 acres planned for the development of Area II in late 1954, with the Bravo site situated in the southwestern corner of the plot. The enlargement of Area II from 100 acres to 451 acres in early 1955 necessitated the realignment of the westerly boundary of AFP 57, and pushed the USAF buffer zone west (ACI and WR, 2009).

Augmenting the test stands, the original facilities at the Bravo site included a terminal house, electrical control stations at each test stand, pre-test building, fuel system infrastructure placed immediately adjacent to the other buildings at the site, and a pill box. The fuel system infrastructure was more sophisticated than that placed at the Alfa site, and as designed in early 1955 included several JP4 tanks and filter pits; a helium bottle rack; both horizontal and vertical LOX tanks (three), with a large concrete pad adjacent to the paired horizontal tanks; a LOX catch tank; and a filled, graded, and compacted pad for future gaseous hydrogen (GH2) tanks. The test stands designed for the Bravo site were identical to those at the Alfa site. The Alfa and Bravo test stands could be adapted for the run-up of different rocket engines under evolving requirements, and in this sense would become distinct from one another over time. A 24-inch line extending from the paired Alfa-site tanks to the northeast provided water for Bravo's deluge system, complemented by a second line extending from the western edge of the Alfa site. By early 1955, there was a small dam at the Bravo site, located along the access road to the blockhouse. The dam was a "conservation dam," used for collecting deluge water after static tests. The primary extant buildings and structures from 1955-1956 at the Bravo site during the 2007 field survey were test stand Bravo I and its electrical control station (Buildings 730 and 730A), test stand Bravo II and its electrical control station (Buildings 731 and 731A), the blockhouse (Building 213), and the terminal house (Building 214). Only the foundation remains at the location of the pre-test building (ACI and WR, 2009)

Constructed along what became known as Bravo Road, the Bravo Test Area consisted of three test stands, Bravo I, Bravo II, and Bravo III, each with its own electrical control station to the northwest of its respective stand. Each stand also had a gunite run-off channel that emptied into a collection area, carved within the terrain. Unlike the other three complexes, at the outset of construction, Bravo I was designed differently from Bravo II and Bravo III, both of which resembled the stands in the other areas. Between Bravo II and Bravo III sat the Terminal House; to the southwest, across the road, were two LOX storage tanks. Between Bravo I and Bravo II sat a GN2 bottle bank. To the west of Bravo II sat the Pre-Test Building; to its south was a GHe bottle bank. The Control House for the complex sat to the east of the test stands, and there was a run-off gathering pond in between. A pill box was placed to the southwest of the test stands. In the 1960s, a third LOX tank was added near the original two, and at an unknown date, a fourth LOX tank joined the other three. Also in the 1960s, two kerosene tanks were placed to the east of Bravo II, where the flame deflector had been. In the 1990s, an office trailer was built to the west of the Pre-Test Building (ACI and WR, 2009).

The Bravo Test Area Historic District contains 10 buildings, 8 of which are contributing resources. Constructed during 1955-1956, the Bravo test site featured the second cluster of static test stands operational for AFP 57 at SSFL. Under Criterion A, the district is eligible for listing in the NRHP for its associations with multiple static engine tests run between 1956 and 1991, beginning with tests of Atlas thrust chambers in 1956, and also supporting testing of F-1 components, Lunar Module Rocket Engine assemblies, and Atlas and Delta RS-27 vernier engines and turbopumps. The Bravo Test Area Historic District also is significant under Criterion C for the design and engineering of the test site. The district includes the test stands and blockhouse, ancillary buildings and structures, and elements of the natural and fabricated landscape. Within the historic district, three of the eight contributing structures were determined individually eligible for the NRHP. The Bravo Control House (Building 213), Bravo I Test Stand, and Bravo II Test Stand were documented as each individually meeting the NRHP criteria for eligibility in the contexts of the Cold War (Military) and Space Exploration, under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because they have achieved exceptional importance within the past

50 years, Criteria Consideration G applies, as well. SHPO concurred on May 15, 2008, with the eligibility of the historic district and its contributing elements, as well as with the individual eligibility of the three structures.

3.3.2.3 Coca Test Area Historic District

The Coca Test Area Historic District was recorded as part of the historic resource assessment survey conducted in August 2007 (ACI and WR 2009). The following is paraphrased from that report.

Designed in mid-1955, and constructed during 1955-1956, the Coca engine test site featured the third cluster of static test stands (Coca I, II, and III) operational for AFP 57 at Santa Susana. The design and construction of the test site followed the design and construction of four similar test sites at SSFL: the Bowl Area of 1948-1950 and the Canyon Area of 1953, for NAA; and the Alfa and Bravo sites of 1954-1955, two of four test sites for the USAF. The original complex consisted of three test stands, Coca I, Coca II, and Coca III, each with its own electrical control station to the southwest of its respective stand. Each stand also had a gunite run-off channel that emptied into a Skim Dam, carved within the terrain. Between Coca II and Coca III sat the Terminal House, and across the road were two LOX storage tanks. Southwest from Coca III sat the Pre-Test Building; south of Coca II was the GN2 and GHe bottle bank; and south of Coca I was a Vehicle Shelter. Located on a cliff to the south of the Pre-Test Building was a Pill Box. The Control House for the complex sat across the Skim Dam from the test stands, towards the northwest. To the southwest of the Control House, there was a JP-4 fuel storage facility (ACI and WR, 2009).

The early 1960s saw large modifications to the Coca Test Area. The Coca I stand was essentially disassembled and rebuilt as a larger facility, and the Coca IV Test Stand, which is almost identical structurally, was built to the east. The gunite channel for Coca I was enlarged, and a spillway was constructed for Coca IV. Both of these test stands were given their own terminal room, which sat underneath their respective service towers. In order to connect these terminal rooms to the Control House, an underground cable tunnel was constructed between the Control House and the Coca I terminal room, with a second tunnel between the Coca I and Coca IV terminal rooms. The Control House was also enlarged, in order to accommodate the new test stand, as well as the new engines to be tested in the complex. The remaining facilities built during the original construction period remained in place and intact, with the exception of Coca II, which was dismantled. Due to the changing nature of the complex, additional facilities were required in order to operate the stands. A second pretest shop, known as the Upper Pre-Test Building, was constructed to the east of the existing Pre-Test Building, and to the southeast of the Coca I stand. Additional fuel facilities were also constructed at this time, as the JP-4 propellant would not be needed. As such, a LH2 tank, with its own electrical control station, was built to the southwest of the test stands; a LN2 tank was placed to the east of the two LOX tanks and south of Coca II; and a third LOX tank, with its own electrical control station, was built to the southeast of Coca I. A GH2 tank, with compressor shelters, was placed well to the east of the test stands, along Test Area Road, and a Bulkhead Test Facility was built south of the Control House. In addition, two new observation bunkers were constructed, one on a cliff to the southeast, for Coca I, and the other to the northeast, off Skyline Drive, for Coca IV (ACI and WR, 2009).

In the early 1970s, further additions and modifications were made to the Coca Test Area, reflecting changes in the types of engines to be tested at the site. The two original LOX tanks and their adjacent LN2 tanks, to the southwest of Coca I, were replaced with a single LOX tank, and another LOX tank was set to the south of the Coca IV stand; a LH2 tank was installed to the northeast of Coca IV. Between Coca I and Coca IV, at the level of the spillways, a High Pressure GH2 and GN2 Vault was constructed for bottles of GN2 and gaseous helium. In addition, a Hydraulic Supply Building was constructed to the east of Coca I, and a Pump House for deflector water was built to the southeast of Coca IV. Since the 1970s renovation, no additional facilities have been constructed within the Coca Test Area. However, in 2005, a forest fire caused the destruction of the Upper Pre-Test Building and the Vehicle Shelter. Additionally, at an unknown date, the Coca III Test Stand was disassembled, as was the Bulkhead Test Facility and the JP-4 fuel shelter (ACI and WR, 2009).

The Coca Test Area Historic District contains 27 buildings, 18 of which are contributing resources. Constructed in 1955-1956, the Coca test site featured the third cluster of static test stands operational for AFP 57 at SSFL. Some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were designed between 1972 and 1978. Under Criterion A, the Coca Test Area Historic District is eligible for listing in the NRHP for its

associations with multiple static engine tests run between 1956 and 1988, beginning with tests of Atlas and Navaho engines in the late 1950s; the J-2 engine in the 1960s in support of Saturn and Apollo; and the Space Shuttle Main Engine in the 1970s and 1980s in support of the Space Shuttle Program. The Coca Test Area Historic District is also significant under Criterion C for the design and engineering of the test site. The district includes the test stands (Figure 7) and blockhouse, ancillary buildings and structures, and elements of the natural and fabricated landscape. Within the historic district, 3 of the 18 contributing structures were determined individually eligible for the NRHP. The Coca Control Center (Building 218), Coca I Test Stand, and Coca IV Test Stand were documented as each individually meeting the NRHP criteria for eligibility in the contexts of the Cold War (Military) and Space Exploration, under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because the district and structures have achieved exceptional importance within the past 50 years, Criteria Consideration G applies, as well. SHPO concurred on May 15, 2008, with the eligibility of the historic district and its contributing elements, as well as with the individual eligibility of the three structures.

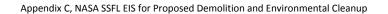


FIGURE 7

NASA Area II Coca Test Stands

October 2011

Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II



SECTION 4

Consultation

4.1 Native American Consultation

4.1.1 Native American Heritage Commission

NASA contacted the Native American Heritage Commission (NAHC) in June 2011 to request information about traditional cultural properties in the SSFL area and tribal representatives in the region. The NAHC responded on June 10, 2011, with a list of Native Americans interested in consulting on development projects. A second inquiry was sent to NAHC in April 2012 and an updated list of Native Americans with an interest in the region was sent to NASA. The correspondence between NASA and NAHC is included in the consultation record.

4.1.2 Tribal Outreach

NASA is conducting formal government-to-government consultation with Native Americans for this undertaking. On June 30, 2011, each of the 15 individuals and groups listed by NAHC, representing both federally recognized and non-federal interested tribes, was contacted by letter (see Table 6). The letter notified the tribes of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8, and to seek input regarding concerns that might be unique to each tribe. On September 30, 2011, NASA mailed a historic structures assessment package to the Santa Ynez and in May 2012, sent a map of the APE for the tribe's review. NASA received an e-mail response on July 12, 2012, from the Santa Ynez requesting to participate as a Section 106 consulting party and a letter on September 19, 2012, formally requesting consultation. Consultation with the federally recognized Santa Ynez and other tribes is ongoing. The consultation will include consideration of flora and fauna in the APE that have known cultural uses to the Santa Ynez. Appendix B contains a summary of the consultation record through December 20, 2013.

TABLE 6
Native American Individuals and Groups Contacted by NASA

Name	Affiliation
Charles Cooke	Chumash, Fernandeño, Tataviam, Kitanemuk
Beverly Salazar Folkes	Chumash, Tataviam, Fernandeño
James Ramos, Chairperson	Serrano
Ronnie Salas, Cultural Preservation Department	Fernandeño, Tataviam
Julie Lynn Tumamait	Barbareno/Ventureño Band of Mission Indians, Chumash
Patrick Tumamait	Chumash
Chief Mark Steven Vigil, San Luis Obispo County Chumash Council	Chumash
Owl Clan, Qun-tan Shup	Chumash
John Valenzuela, Chairperson, San Fernando Band of Mission Indians	Fernandeño, Tataviam, Serrano, Vanyume, Kitanemuk
Randy Guzman - Folkes	Chumash, Fernandeño, Tataviam, Shoshone Paiute, Yaqui
Vennise Miller, Chairperson, Coastal Band of the Chumash Nation	Chumash
Carol A. Pulido	Chumash
Melissa M. Parra-Hernandez	Chumash
Frank Arredondo	Chumash
Freddie Romero, Santa Ynez Band of Chumash Indians	Chumash

There have been several on-site consultations with the Santa Ynez as well as with other tribes identified by NAHC. NASA has been in communication with the Santa Ynez and other tribes identified by NAHC regarding appropriate protection measures for sensitive archeological sites. NASA met with the Santa Ynez and state tribes at SSFL on November 25, 2013. The group discussed the adverse effects on archeological resources disclosed in the DEIS and appropriate mitigation measures to address the adverse effects on the identified resources. Protection measures for sensitive archeological sites prior to and during cleanup activities were also discussed. NASA proposed creating a Native American Advisory Board to create a more formal mechanism for dialogue between NASA and the tribes prior to and during cleanup activities on the NASA-administered portion of SSFL. Some of the mitigation suggestions will be included in an agreement document or ROD for the EIS.

NASA has also met independently with the Santa Ynez specifically regarding the Indian Sacred Site, which was designated in December 2012. NASA continues consultation with the Santa Ynez regarding potential impacts to the Indian Sacred Site and measures to mitigate the impacts on the sacred site. This consultation is confidential and is not included in Appendix B due to the sensitive nature of the sacred site.

Native Americans in the region were contacted as a part of the Traditional Cultural Property and Cultural Landscape Assessment in the summer of 2013. Those who wished to participate in the study were interviewed as a part of this investigation and evaluation. The report of these findings and interview outcomes will remain confidential.

4.2 Section 106 Consultation

NASA formally initiated NHPA Section 106 consultation with the California SHPO and the ACHP on June 30, 2011. The initiation letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. On July 20, 2011, the ACHP responded to NASA by letter, confirming that it would participate in the consultation process. On August 5, 2011, the SHPO telephoned and sent an e-mail confirming its participation in the consultation. The consultation letters are summarized in Appendix B and are included in the consultation record.

NASA held the first Section 106 consulting party meeting with the identified consulting parties on March 1, 2012. The purpose of the meeting was to introduce the project to the consulting parties and to present information about the project, including the proposed APE, NASA's Proposed Action, and the identified historic properties that potentially would be affected by the project. This meeting, held at SSFL, also included a tour of the site.

Participants in the first Section 106 meeting included the following consulting parties: Mark Beason, William Preston Bowling, Wayne Fishback, John Luker, Tom McCulloch, Mark Osokow, Chris Rowe, Susan Stratton, Barbara Tejada, Christina Walsh, Abraham Weitzberg, and Ronald Ziman. Others in attendance at the meeting included Jim Biederman and Maureen Sheehan with the General Services Administration (GSA). Meeting minutes were posted on the SSFL Environmental Cleanup and Closure public website (http://ssfl.msfc.nasa.gov) on August 23, 2012, and the parties were notified the minutes were available for review.

There is an application process in place for individuals or groups who would like to become consulting parties. Individuals applied to be consulting parties and were accepted by NASA between the first meeting in March 2012 up until November 2013. Table 7 lists the participating consulting parties and affiliated organizations as of December 31, 2013. Appendix B contains a summary of the consultation and relevant correspondence between NASA and the consulting parties.

Eight consultation meetings were held between March 1, 2012 and February 13, 2014. On October 30, 2012, the second consultation meeting was held via teleconference. The NEPA in lieu of Section 106 consultation process was discussed, as was the simultaneous, yet largely confidential, Native American consultation process. The APE and potential soil cleanup areas were reviewed. Primarily, NASA was soliciting ideas and suggestions for potential measures to minimize impacts to historic properties and measures to mitigate the adverse effect on historic properties from the undertaking. A bullet list summary of the issues discussed at the meeting was circulated to the consulting parties for comment before the more detailed meeting summary was submitted. NASA requested

comments and suggestions by December 1, 2012. The finalized meeting notes were posted on the SSFL website on January 31, 2013.

The third consultation meeting was held at SSFL on March 15, 2013, with some people participating via teleconference. The meeting was used to discuss the definitions of traditional cultural properties and cultural landscapes. NASA also notified the consulting parties of the upcoming Traditional Cultural Property and Cultural Landscape Assessment that will include interviews of local, state, and national tribal members in the area. NASA solicited suggestions and contact information for people to be interviewed as a part of this investigation. Two consulting parties, Wayne Fishback and Christina Walsh, gave brief presentations to the group.

The next meeting was held after the August 2, 2013 release of the Draft EIS for public comment. It was held onsite at SSFL with some parties participating via teleconference. Impacts to historic properties identified in the Draft EIS were discussed, as well as appropriate mitigation measures to address the adverse effects on historic properties. NASA noted the comments received and the suggested mitigation measures, as well as stated concerns about the NEPA, demolition, and cleanup schedules.

The next consulting party meeting was held on September 11, 2013, via teleconference only. One of NASA's objectives was to have the parties concur that there would be an adverse effect on architectural and archeological resources from the Proposed Action. No vote was taken, but no comments were made to indicate disagreement the adverse effects identified in the Draft EIS. There was a continued discussion of appropriate mitigation measures to address the adverse effect on historic properties. The parties also discussed the GSA excess property process. James Biederman with GSA talked about the GSA's process for excess property and for property transfer. There will be a separate Section 106 process for the GSA property transfer after completion of the mandated cleanup activities.

The next consulting party meeting was held on site at SSFL on September 20, 2013, and included a tour of the three historic districts (Alfa, Bravo, and Coca Test Area Historic Districts) prior to the meeting. This meeting was intended to be limited to discussion of architectural resources; however, archeological resources were also discussed. Due to consulting party concerns about the NEPA, demolition and cleanup schedules, NASA indicated it was considering deferring demolition on some of the buildings in the Alfa and Bravo Test Area Historic Districts. Coca Test Area Historic District, however, would need to be demolished as part of the cleanup, due to the excessive contamination and high cost of maintenance. The Santa Ynez have also requested that Coca be demolished because of the Indian Sacred Site.

On November 1, 2013 a consulting party meeting was held onsite at SSFL. The objective of this meeting was to resolve the adverse effects on historic properties through the final discussion of appropriate measures to address the adverse effects on archeological and architectural resources. NASA indicated that the draft Programmatic Agreement (PA) would be distributed to the consulting parties for their review and comment. As such, NASA would need consulting party input on the final mitigation measures. Several parties expressed a desire to preserve Coca because of its historic significance for its association with the Apollo and Space Shuttle programs. NASA reiterated that the Coca Test Area Historic District would be demolished as part of the scheduled cleanup action because it is the most highly contaminated of the districts and would be the costliest to maintain. The consulting parties committed to sending NASA in writing their preferred mitigation measures for both the archeological and the architectural resources impacted by the cleanup activities. NASA committed to sending the consulting parties the draft PA for review in December 2013.

NASA has met with or communicated with SHPO, ACHP, and Section 106 consulting parties at strategic points of the EIS planning process to review project data, to discuss the APE, to identify historic properties, to identify effects on historic properties and to discuss measures to mitigate adverse effects on cultural, historic, archeological, and Native American resources that could result from the Proposed Action. As part of this process, there have been additional electronic communications regarding the proposed APE for comment (in May 2012); the final APE (October 2012); dispersal of meeting notes for comment; and consulting party comments on meetings, announcements, or issues raised at meetings. Meeting notes from all the consulting party meetings were posted on the NASA website by January 30, 2014.

NASA will hold a consultation meeting on February 13, 2014 on-site at SSFL and via teleconference. Consulting parties received the draft PA on December 19, 2013 and were given the opportunity to submit comments on the draft by January 17, 2014. This meeting is intended to go over the changes to the draft PA based on the comments submitted by agencies and consulting parties.

Ultimately, the consultation process will culminate in appropriate measures to address effects on historic properties. An agreement document formalizing the agreement among the parties will be a part of the Record of Decision (ROD). If the agreement document is signed and executed prior to completion of the Final EIS, it will be attached to this report and to the Final EIS. If the agreement document is not executed prior to completion of the Final EIS, the agreement or the stipulations will be included in the ROD. The executed agreement document or the ROD will close the Section 106 process for this undertaking.

TABLE 7
Santa Susana Field Laboratory Environmental Cleanup Section 106 Consulting Parties
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

First Name	Last Name	Organization
Mark	Beason	California Office of Historic Preservation
Carla	Bollinger	Santa Susana Mountain Park Association
Bill	Bowling	Aerospace Contamination Museum of Education
Gary	Brown	National Park Service, Santa Monica Mountains National Recreation Area
Harry	Butowsky	Private contractor
Sam	Cohen	Santa Ynez Band of Chumash Indians
Michael	Collins	EnviroReporter.com
Nicole	Doner	Ventura County Cultural Heritage Board
Wayne	Fishback	NA
Beverly	Folkes	Native American Monitoring Group
Elizabeth	Harris	NA
Luhui	Isha	NA
Nancy	Kidd	Simi Valley Historical Society
Christian	Kiillkkaa	NA
Dan	Larson	Compass Rose Archaeological
John	Luker	Santa Susana Mountain Park Association
Tom	McCulloch	Advisory Council on Historic Preservation
Mark	Osokow	San Fernando Valley Audubon Society
Gwen	Romani	Compass Rose Archaeological
Freddie	Romero	Santa Ynez Band of Chumash Indians
John Tommy	Rosas	Tongva Ancestral Territorial Tribal Nation
Bruce	Rowe	NA
Chris	Rowe	NA
Alan	Salazar	NA
Margie	Steigerwald	National Park Service
Clark	Stevens	Resource Conservation District of the Santa Monica Mountains
Susan	Stratton	California Office of Historic Preservation
Brian	Sujata	Santa Susana Field Laboratory Community Advisory Group
Barbara	Tejada	Ventura County Archaeological Society
George	Toren	Compass Rose Archaeological
Mati	Waiya	NA
Christina	Walsh	cleanuprocketdyne.org
Abraham	Weitzberg	NA
Mary	Wiesbrock	Save Open Space
Ronald	Ziman	NA

Notes:

NA = not applicable

Accepted consulting parties as of January 17, 2014

SECTION 5

Historic Properties

5.1 Standards of Significance

Standards of significance for cultural resources in the APE were identified using standards from the following sources:

- National Register Bulletin 15-How to Apply the National Register Criteria for Evaluation (NPS, 1997)
- Instructions for Recording Historical Resources (OHP, 1995)

The protection of historic properties is governed by several federal laws and regulations, including the NHPA (1966), the Archeological and Historic Preservation Act (1974), the American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (1990).

Under Section 110 of the NHPA, historic properties under the jurisdiction or control of a federal agency must be identified and evaluated for listing in the NRHP. Section 106 of the NHPA states that federal agencies must take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP.

The enabling legislation for Section 106 is contained in 36 CFR 800, "Protection of Historic Properties." The Section 106 process entails three basic steps:

- 1. Identify historic properties potentially affected by the undertaking.
- 2. Assess adverse effects on historic properties.
- 3. Seek ways to avoid, minimize, or mitigate adverse effects on historic properties.

In accordance with 36 CFR 800, determinations regarding the potential effects of an undertaking on historic properties are presented to SHPO, federally recognized Native American tribes, and other interested parties. The effects analysis and findings for this Proposed Action are presented in Section 4 of the EIS and are not included in this report.

Under Section 106 of the NHPA, an adverse effect is found when an undertaking (Proposed Action) may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative. Following are examples of adverse effects:

- Physical destruction or damage
- Alteration inconsistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties
- Relocation of the property
- Change in the character of the property's use or setting
- Introduction of incompatible visual, atmospheric, or audible elements
- Neglect and deterioration
- Transfer, lease, or sale out of federal control without adequate preservation restrictions

Under NEPA, federal agencies are required to consider the environmental impacts of their Proposed Actions and to incorporate reasonable alternatives to those actions. NEPA requires discussion of significant environmental impacts and reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. NEPA recognizes direct, indirect, and cumulative effects. As defined by NEPA, direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action but are later in time or farther removed in distance, yet are still reasonably foreseeable. Cumulative effects are the effects

on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. NEPA recognizes both detrimental and beneficial effects.

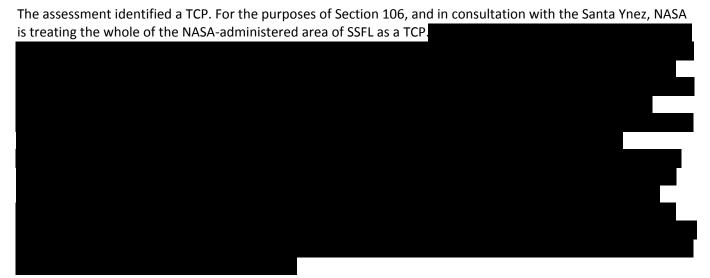
One of the requirements of NEPA is to "preserve important historic, cultural, and natural aspects of our national heritage" (Sec. 101 [42 United States Code [U.S.C.] § 4331]). According to NEPA regulations, in considering whether an action may "significantly affect the quality of the human environment," an agency must consider the following, among other things:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources (40 CFR 1508.27(b)(3))
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP (40 CFR 1508.27(b)(8))

5.2 National Register of Historic Places Status

5.2.1 Traditional Cultural Properties and Cultural Landscapes

To identify any additional historic properties, specifically, TCPs and cultural landscapes, NASA commissioned a Traditional Cultural Properties and Cultural Landscape Assessment for SSFL and its vicinity. The goal of this assessment was to investigate the existence and extent of a potential TCP and to assess the potential for a significant cultural landscape. This was a preliminary investigation, meaning that the majority of the historic context and ethnographic information came from existing documentation. The other element of the assessment was to conduct interviews with local individuals to ascertain the current and previous ethnohistoric use of the region and the influence of flora and fauna in area development. The interview list contained several individuals who could possess pertinent information. Authorities consulted included knowledgeable individuals within the different Native American communities with ties to the region, as well as specialists in ethnography, history, anthropology, and archeology. Additional archival research was completed for this assessment. Sources included technical journals, ethnographic accounts, historical interviews, and professional presentations.



A report was prepared for this assessment in support of NEPA and Section 106 of the NHPA. Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings (the Proposed Action) on historic properties. Regulation 36 CFR 800 defines a historic property as any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the NRHP. Due to the sensitive nature of the material discussed in this technical report, this report will remain confidential. Section 9 of the Archaeological Resources Protection Act of 1979 and 36 CFR 800.11(c) discusses the confidentiality of archeological sites. A copy of this report will be filed with the SCCIC in Fullerton, California in accordance with state law.

5.2.2 Archeological Resources

Three archeological sites are located within the APE. the Burro Flats site, was listed in the NRHP in 1976. Two previously identified sites, are potentially eligible for listing in the NRHP. These properties are discussed in greater detail in Section 3.3.1. Table 8 lists each site and its NRHP status.

Identified Archeological Resources in the APE

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Site Number	Property Name	NRHP/CRHR
	Burro Flats	Listed
		Potentially Eligible
		Potentially Eligible

Notes:

CRHR = California Register of Historical Resources

NRHP = National Register of Historic Places

5.2.2.1 Site No.

The Burro Flats site was first recorded in 1959 (Rozaire, 1959). At that time, NRHP significance criteria had not been developed. The NRHP nomination form from 1975 does not indicate under which criterion the site is eligible. The NRHP website indicates that the site is significant for its informational potential, which would be Criterion D (NRHP, 2013). The Burro Flats site was listed in the NRHP and the CRHR in May 1976. No change in status is recommended.

5.2.2.2 Site No.

This site was recommended eligible for the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The California SHPO reviewed this recommendation as part of a Section 110 consultation in February 2009, and commented that the sparse collection of artifacts and lack of features appeared to indicate that the site may have been used only rarely and could represent a single episode of use. Through communications in 2009, NASA and SHPO agreed the site would be considered potentially eligible for listing in the NRHP when an undertaking was identified and potential effects on historic properties were analyzed. Correspondence between NASA and SHPO regarding is included in the consultation record.

5.2.2.3 Site No.

This site is recommended eligible for the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. This recommendation has not yet been reviewed by the California SHPO. For the purposes of this undertaking, this site is being treated as potentially eligible for listing in the NRHP.

5.2.2.4 Archeological Historic District

The three archeological sites (a) recorded within the APE do not meet the criteria established by the NPS to be considered an archeological district. Each site contains unique and unconnected constituents and there is no clear linkage or continuity between them. To be considered a district, archeological sites must possess "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development" (NPS, 2000). Also as stated in Bulletin 36, "A district derives its importance from being a unified entity, even though it is often composed of a wide variety of resources. The identity of a district results from the interrelationship of its resources, which can convey a visual sense of the overall historic environment or be an arrangement of historically or functionally related properties." These three archeological sites do not readily meet any of these criteria.

5.2.3 Architectural Resources

The built environment survey conducted in the fall of 2007 (ACI and WR, 2009), included a review and reconnaissance of the 139 federally owned buildings, structures, and sites within the APE, specifically within Area II of SSFL. ACI and WR identified one structure, a well, in Area I, but there is also a truck scale with a small operators shed in Area I, which are owned by Boeing (NASA 2013).

Three historic districts were recorded and evaluated for NRHP eligibility in August 2007 (ACI and WR, 2009). The historic districts are eligible for the NRHP under Criteria A and C. Within these historic districts, nine buildings are individually eligible for listing in the NRHP. The districts and structures have achieved exceptional importance within the past 50 years, and therefore, Criteria Consideration G applies. SHPO concurred on May 15, 2008, with the eligibility of the historic districts and their contributing elements, as well as with the individual eligibility of the nine structures. No change in status is recommended for the three districts. These properties are discussed in greater detail in Section 3.3.2. Table 9 lists the NRHP-eligible historic structures in the APE.

5.2.3.1 Alfa Test Area Historic District

The Alfa Test Area Historic District contains 10 contributing resources, 3 of which are also individually eligible for the NRHP. Constructed during 1954-1955, the district includes the test stands and control house, two observation structures, a terminal house, stand talker shack, electrical control stations, and elements of the natural and constructed landscape.

5.2.3.2 Bravo Test Area Historic District

The Bravo Test Area Historic District contains eight contributing resources, three of which are also individually eligible for the NRHP. Constructed during 1955-1956, the proposed district includes the test stands and control house, one observation structure, a terminal house, electrical control stations, and elements of the natural and constructed landscape.

5.2.3.3 Coca Test Area Historic District

The Coca Test Area Historic District contains 18 contributing resources, 3 of which are also individually eligible for the NRHP. Originally constructed during 1955-1956, some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were designed between 1972 and 1978. The district includes the test stands and control center, three observation structures, a pre-test building, electrical control stations, compressor buildings, a pump house, a cable tunnel, and other auxiliary structures, as well as elements of the natural and constructed landscape.

TABLE 9
National Register of Historic Places Status of Historic Structures within the APE
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

		NRHP Status		
Structure #	Structure Name	Individually Eligible	Contributes to the District	
Alfa Test Ared	a Historic District			
208	Alfa Control House	Х	Х	
209	Alfa Terminal House		X	
727	Alfa 1 Test Stand	Χ	X	
727A	Alfa 1 Electrical Control Station		X	
2729	Alfa 3 Test Stand	X	X	
729A	Alfa 3 Electrical Control Station		X	
739	Stand Talker Shack		Χ	
2X	Alfa Observation Structure (Pill Box)		X	
2Y	Alfa Observation Structure (Pill Box)		X	
NA	Alfa Landscape/Spillway		Χ	
Bravo Test Ar	ea Historic District			
213	Bravo Control House	X	X	
214	Bravo Terminal House		X	
730	Bravo 1 Test Stand	X	X	
730A	Bravo 1 Electrical Control Station		Χ	
731	Bravo 2 Test Stand	X	X	
731A	Bravo 2 Electrical Control Station		Χ	
2Z	Bravo Observation Structure (Pill Box)		Χ	
NA	Bravo Landscape/Spillway		Χ	
Coca Test Are	a Historic District			
218	Coca Control Center	X	Χ	
222	Coca Pre-Test Building		Χ	
235	Coca Electrical Control Station (LOX)		X	
236	Coca Electrical Control Station (LH2)		X	
237	Coca GH2 Compressor Building		X	
239	Coca GH2 Compressor Building		X	
241	Coca Pump House		X	
520	Coca High Pressure GH2 and GN2 Vault		X	
614	Coca 4 Observation Structure (Pill Box)		X	
733	Coca 1 Test Stand	Χ	X	
787	Coca 4 Test Stand	Χ	X	
2A	Coca North Observation Structure (Pill Box)		X	
2B	Coca Observation Structure (Pill Box)		X	
V99	Coca GH2 Vessel		X	
V100	Coca LH2 Vessel #1		X	

TABLE 9
National Register of Historic Places Status of Historic Structures within the APE
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

		NRHP Status	
Structure #	Structure Name	Individually Eligible	Contributes to the District
V108	Coca LOX Vessel #1		Х
	Coca Cable Tunnel		X
NA	Coca Landscape/Spillway		X

Notes:

GH2 = gaseous hydrogen

GN2 = gaseous nitrogen

LH2 = liquid hydrogen

LOX = liquid oxygen

NRHP = National Register of Historic Places

SECTION 6

Summary of Project Effects

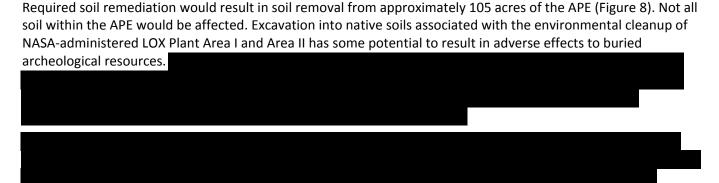
6.1 Effects Finding from Proposed Action

NASA is proposing to demolish existing structures and to remediate contaminated soil and groundwater on the NASA-administered property at SSFL. The purpose of the Proposed Action (the undertaking) is to remediate the environment to a level that meets NASA's environmental cleanup responsibilities and to undertake the demolition actions necessary to support both remediation and property disposition. The Proposed Action calls for remediation of contaminated soils (Figure 8) to meet the 2010 AOC requirements, remediation to meet the 2007 Consent Order, and up to 100 percent demolition of structures. Because of the volume of soil removal required, and the demolition of historic structures, the Proposed Action would result in an adverse effect to historic properties. The effects analysis and findings are discussed in detail in Section 4 of the EIS.

6.1.1 Traditional Cultural Property

The ground-disturbing activities associated with demolition, soil remediation, and groundwater remediation would affect the identified TCP. Required soil remediation would result in soil removal from approximately 105 acres of the APE (Figure 8). Excavation into native soils associated with the environmental cleanup of NASA-administered LOX Plant Area I and Area II would result in an adverse effect on the TCP, which encompasses the whole NASA-Administered area. Through consultation with SHPO, ACHP, tribes, and consulting parties, NASA is in the process of determining appropriate measures to mitigate the effects on the TCP. These measures will be stipulated in the executed agreement document or in the ROD.

6.1.2 Archeological Resources



Site some six is not within the footprint of soil or groundwater remediation areas and would not be affected by the Proposed Action.

Due to the quantity of soil proposed for removal under the Proposed Action, the possibility exists that previously undiscovered archeological sites also could be affected, resulting in additional impacts on potential historic properties.

The footprint of the soil remediation areas, as depicted in Figure 2, currently shows a few cleanup areas outside the existing APE. When the remediation footprint is finalized, through consultation, the APE may need to be adjusted and these areas may need to be surveyed for cultural resources.

6.1.2.1 Potential for Undiscovered Archeological Resources

In parts of the APE, the potential exists for archeological resources to have been buried through alluviation, colluviation, or Aeolian processes, and such resources would not be found during the surface cultural resources reconnaissance surveys conducted to date.



Archeological excavations have resulted in the documentation of subsurface deposits. This site is listed in the NRHP and has the potential to yield further significant data about the nature of human occupation of the area. Aside from the initial recordation, neither site and the depth of deposits is unknown.

An unanticipated discoveries plan will be included in the agreement document or in the ROD and will be implemented to address the possibility of impacts on previously unidentified buried resources from the undertaking.

6.1.2.2 Discovery of Human Remains

Human remains shall be treated with respect and dignity upon discovery. The County Coroner must be notified of the discovery of human remains within 48 hours; the State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98.

In addition, the NASA Federal Preservation Officer in the Environmental Management Division at NASA Headquarters must be contacted. If the Coroner determines the human remains to be Native American, NASA will initiate the proper procedures under the Archaeological Resources Protection Act of 1979 and/or the NAGPRA to decide the disposition of the materials. If the remains are found to be Native American, the steps outlined in NAGPRA, 43 CFR 10.6 (Inadvertent Discoveries) must be followed.

6.1.3 Architectural Resources

The Proposed Action calls for demolition of up to 100 percent of the structures on NASA-administered areas. It should be noted, that even if demolition is not necessary to meet cleanup goals, removal of a structure might occur as a result of other site planning or disposal requirements. Fifty-five buildings are proposed for demolition within the boundaries of the three historic districts, including the contributing elements of the districts and the nine individually eligible structures. The analysis of impacts from proposed demolition activities considers the removal of up to 100 percent of the structures on the NASA-administered property.

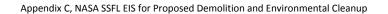
The demolition of contributing structures in the Alfa, Bravo, and Coca Test Area Historic Districts would result in adverse effects on each of these districts. Demolition of individually eligible or contributing structures also would have an adverse effect on historic properties. Demolition of noncontributing structures within the three districts would affect the setting and feeling of the districts due to the change in setting and visual character of the historic districts.

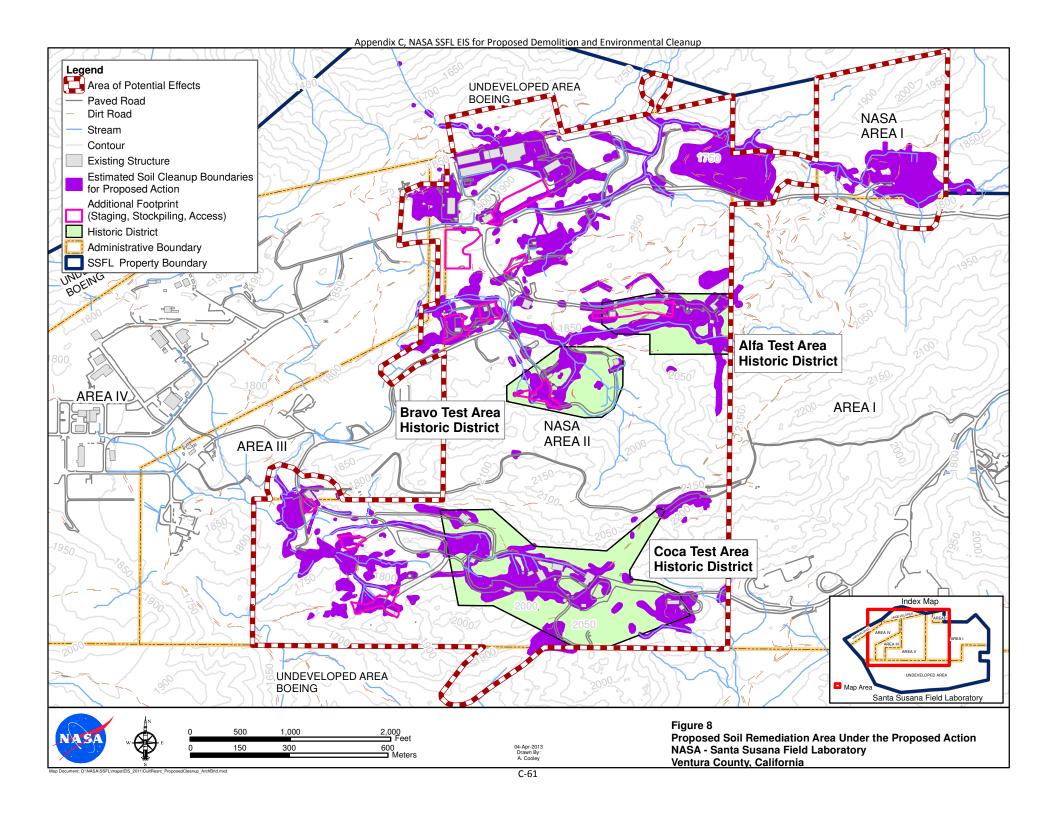
6.1.4 Indian Sacred Site

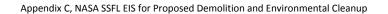
Although the boundaries of the Santa Ynez Indian Sacred Site have not formally been established, this analysis assumes that all of the APE would be included in the sacred site designation. The ground-disturbing activities associated with demolition, soil remediation, and groundwater remediation would affect the sacred site. Through consultation, NASA and the tribe will determine appropriate measures to mitigate the effects on the sacred site. This consultation is confidential and ongoing.

6.1.5 Cultural Flora and Fauna

Of the documented species inventoried on the NASA-administered property at SSFL during the biological investigations, as noted in Section 1.4, six plants and five animals were identified as having known cultural use by the Santa Ynez (Table 1). Section 3.4.4 of the EIS indicates that none of these plants or species is listed as rare, threatened, or endangered, suggesting there is no danger of extinction of these plants and animals in the region. The Proposed Action would affect specific plants of this type in the areas of remediation, but would not threaten their existence or their cultural use by the tribe.







6.2 Resolution of Adverse Effect

Using the NEPA process in lieu of Section 106 enables the submission of the Draft EIS to SHPO, the ACHP, and other consulting parties to suffice for environmental documentation of historic properties (36 CFR 800.8(c)(4)(i)(A). Because the Proposed Action would result in an adverse effect to historic properties, a binding commitment to measures that avoid, minimize, or mitigate adverse effects on historic properties will be part of the ROD, in accordance with 36 CFR 800.8. Through the continuing consultation process, specific and appropriate measures to avoid, minimize, or mitigate adverse effects on historic properties are being determined and finalized. Consultation with SHPO, ACHP, Native Americans, and consulting parties is ongoing regarding the appropriate measures to mitigate the adverse effect. NASA sent the draft PA, which stipulates the mitigation measures, to the parties on December 19, 2013 for their review and comment.

Ultimately, the consultation process will culminate in appropriate measures to address adverse effects on historic properties. An agreement document formalizing the agreement among the parties or NASA's binding commitment will be a part of the ROD. If the agreement document is signed and executed prior to completion of the Final EIS, it will be attached to this report and to the Final EIS. If the agreement document is not executed prior to completion of the Final EIS, it will be included in the ROD. NASA may decide to proceed with the ROD in lieu of an agreement document per 36 CFR 800.8 due to time constraints.



SECTION 7

Conclusions

Historic properties within the APE include the Burro Flats site ; the Alfa, Bravo, and Coca Test Area Historic Districts; and nine individually NRHP-eligible structures within the three districts. Sites and are being considered potentially eligible for the NRHP for the purposes of this undertaking. Additionally, for the purposes of NHPA Section 106, NASA is treating the whole of the NASA-administered area of SSFL as a TCP. The NASA-administered areas of SSFL also have been declared an Indian Sacred Site by the Santa Ynez, in accordance with EO 13007.

NASA initiated NHPA Section 106 consultation with the SHPO and the ACHP in June 2011. The letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. The APE for this project was developed in consultation with the SHPO in 2011 and 2012.

NASA has found that the Proposed Action—demolition of existing structures, soil cleanup to background levels, and groundwater cleanup—would result in an adverse effect on historic properties, as detailed in the effects analysis and findings in the cultural resources subsection of Section 4 of the EIS.

Through continuing consultation, specific and appropriate measures to avoid, minimize, or mitigate adverse effects on historic properties are being determined and finalized. Consultation with SHPO, ACHP, Native Americans, and consulting parties is ongoing regarding the appropriate measures to mitigate the adverse effect. NASA sent the draft PA (the agreement document) which stipulates the mitigation measures, to the parties on December 19, 2013 for their review and comment.

The agreement document formalizing the agreement among the parties will be a part of the ROD. If the agreement document is signed and executed prior to completion of the Final EIS, it will be attached to this report and to the Final EIS. If the agreement document is not executed prior to completion of the Final EIS, it will be included in the ROD. NASA may decide to proceed with the ROD in lieu of an agreement document per 36 CFR 800.8 due to time constraints.



SECTION 8

Bibliography

Archaeological Consultants, Inc. & Weitze Research (ACI and WR). 2009. *Revised Historic Resources Survey and Assessment of the NASA Facility at Santa Susana Field Laboratory, Ventura County, California*. Manuscript on file with NASA, George C. Marshall Space Flight Center, Huntsville, Alabama.

Arnold, Jeanne E., ed. 2004. "Organization of Island Chumash," *Foundations of Chumash Complexity*. The Cotsen Institute of Archaeology at UCLA, Los Angeles, California.

Baker, Eugene C. 2013. Texas State Historical Association. *Mexican Colonization Laws*. http://www.tshaonline.org/handbook/online/articles/ugm01. Accessed June 26, 2013.

Beebe, Rose Marie and Robert M. Senkewicz. 2001. *Lands of Promise and Despair: Chronicles of Early California,* 1535-1846. Santa Clara University, Santa Clara, California.

Byrd Brian F. and L. Mark Raab. 2007. "Prehistory of the Southern Bight: Models for a New Millennium." In *California Prehistory, Colonization, Culture, and Complexity,* edited by Terry L. Jones and Kathryn A. Klar. AltaMira Press, Lanham, Maryland. Pp. 215-227.

California Environmental Quality Act (CEQA). 2002. Statues and Guidelines. http://www.ceres.ca.gov/ceqa/. Accessed on April 2, 2011.

California Missions Foundation. 2008. The Missions. Mission Santa Barbara.

http://www.californiamissionsfoundation.org/home.html. Accessed on August 2, 2011.

California State Military Museum. 2011. *Historic California Posts: Los Angeles Municipal Airport (Mines Field)*. http://www.militarymuseum.org/MinesField.html. Accessed on July 17, 2011.

California State Parks. 2011. *California Indian Languages: Uto-Aztecan Tribes*.

http://www.parks.ca.gov/?page_id=23735. Accessed on August 4, 2011.

Chartkoff, Joseph L. and Kerry Kona Chartkoff. 1984. *The Archaeology of California*. Stanford University Press, Palo Alto, California.

Cohen, Sam. 2011. E-mail Communication with NASA. December 13, 2011.

Cook, Sherburne F. 1976. *The Population of the California Indians 1769-1970.* University of California Press, Berkeley, California.

Council on Environmental Quality (CEQ). 1970. 40 Code of Federal Regulations Parts 1500-1508. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act.

Digital Desert. 2011. *Mojave Desert Indians: Tataviam Indians*. http://mojavedesert.net/tataviam-indians/. Accessed on August 4, 2011.

Earle, David D. and Stephen O'Neal. 1994. *Newport Coast Archaeological Project: An Ethnohistoric Analysis of Population, Settlement, and Social Organization in Coastal Orange County at the End of the Late Prehistoric Period.* Prepared by The Keith Companies, Irvine, California. Manuscript on file at the South Central Coastal Information Center, California State University, Fullerton, California.

Emmick, Jamelon and James C. Bard. 2008. *Final Cultural Resources Inventory of Santa Susana Field Laboratory NASA Areas I and II, Ventura County, California*. Prepared for the National Aeronautics and Space Administration, Marshall Space Flight Center. Manuscript on file at the South Central Coastal Information Center, California State University, Fullerton, California.

Fages, Pedro. 1775. "The Chumash Indians of Santa Barbara." In *The California Indians: A Source Book*. Edited by R.F. Heizer and M. A. Whipple. Published by University of California Press, Berkeley.

Fenenga, Franklin. 1973. Archaeological Survey of the Area of Air Force Plant 57, Coca Test Area, Santa Susana Field Laboratory, Ventura County, California. Survey report prepared for Rocketdyne Division of Rockwell International. Edited by R. F. Heizer and M.A. Whipple. University of California Press, Berkeley 1978. Pp. 255-261.

Federal Register. 1996. Presidential Documents. Executive Order 13007 of May 24, 1996. Indian Sacred Sites. Federal Register. Volume 61. Number 104. May 29.

Fredrickson, D.A. 1984. "The North Coastal Region." *California Archaeology*. Edited by M.J. Moratto, Academic Press, Orlando. Pp. 471-528.

Galvin Preservation Associates. 2011. Westside Historic Context & Survey Report, City of Ventura. http://www.cityofventura.net/files/file/comm-

<u>develop/Historic%20Preservation/Historic%20Survey%20Report%20January%202011.pdf</u>. Accessed on August 2, 2011.

Gamble, Lynn H. 2002. "Archaeological Evidence for the Origin of the Plank Canoe in North America.". In *American Antiquity*, Vol. 6, No. 2. Pp. 301-315.

Gilreath, Amy J. 2007. "Rock Art in the Golden State: Pictographs and Petroglyphs, Portable and Panoramic." In *California Prehistory, Colonization, Culture, and Complexity*. Edited by Terry L. Jones and Kathryn A. Klar. AltaMira Press, Lanham, Maryland. Pp. 273-298.

Goodyear, Albert C. 2005. "Evidence for Pre-Clovis Sites in the Eastern United States." In *Paleoamerican Origins:* Beyond Clovis. Edited by R. Bonnischen et al. Texas A&M University, College Station, Texas. Pp. 103-112.

Gutierrez, Ramon A., and R. J. Orsi. 1998. *Contested Eden: California before the Gold Rush*. University of California Press, Berkeley, California.

Hardwick, Michael R. 2011. *Californians and the Military: Jose de la Guerra y Noriega, Military Commander of Santa Barbara*. http://www.militarymuseum.org/delaguerra2.html. Accessed on August 4, 2011.

Higgins, Paul. 1996. *The Tataviam: Early Newhall Residents*. Old Town Newhall Gazette. January-February 1996. http://www.scvleon.com/newhall/tataviam.htm. Accessed on August 3, 2011.

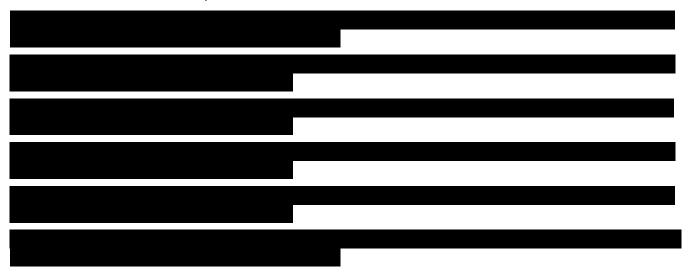
Irwin, W. B. 1975. *National Register of Historic Places Inventory – Nomination Form for Burro Flats Painted Cave (and Community Hill), Ventura County, California*. Site record 56-001072 on file, CHRIS, California State University, Fullerton.

Johnson, John R. 2006. *Ethnohistoric Overview for the Santa Susana Pass State Historic Park Cultural Resources Inventory Project*. Prepared for Southern Service Center State of California Department of Parks and Recreation. June.

King, Chester. 1967. "The Sweetwater Mesa Site (LAN-267) and its Place in Southern California Prehistory." *University of California Archaeological Survey Annual Reports.* 1966-1967: 25-76.

King, Chester. 1971. "Chumash Inter-Village Economic Exchange." *The Indian Historian* Vol. 4, No. 1. American Indian Historical Society: 31-34, San Francisco, California.

King, Chester. 2012. "Stone, Bone and Shell Artifacts and Antiquity of a Ritual Site in the Eastern Simi Hills." Paper Presented at the Society for California Archaeology 46th Annual Meeting: Symposium 16 Recent Archaeology in the Western San Fernando Valley and Environs.



Knight, A. 2012. "Three Chumash Style Rock Art Sites in Fernandeño Territory." Paper presented at the Society for California Archaeology (SCA). 2012. 46th Annual Meeting: Symposium 16 Recent Archaeology in the Western San Fernando Valley and Environs.

Langenwalter, Paul E., Matthew A. Boxt, Lawrence M. Boxt and Theodore T. Miller. 2001. "A Sea Otter (*Enhydra lutris*) Femur with Embedded Projectile Point Fragment from a Late Prehistoric Camp Site in Long Beach, California.". In *Pacific Coast Archaeological Society Quarterly*. Volume 37, No. 1, Winter 2001.

Lech, Steve. 2004. Along the Old Roads, A History of the Portion of Southern California that Became Riverside County 1772-1893. Published by author.

Los Angeles County. 2008. *North Los Angeles/Kern County Recycled Water Project Final Environmental Impact Report*. November. http://dpw.lacounty.gov/wwd/web/Documents/peir_final/3.4%20Cultural_FEIR.pdf. Accessed on September 24, 2012.

McCawley, William. 1996. *The First Angelinos: The Gabrieleño Indians of Los Angeles*. Malki Museum Press/Ballena Press, Morongo Indian Reservation, California.

McClintock, Robin, Julie Wilt, and Jamelon Emmick. 2009. *Cultural Resources Inventory of Soil Remediation Areas of Santa Susana Field Laboratory NASA Areas I and II, Ventura County, California*. Prepared for the National Aeronautics and Space Administration, Marshall Space Flight Center. Manuscript on file at the South Central Coastal Information Center, California State University, Fullerton, California.

Moratto, Michael. 1984. California Archaeology. Coyote Press, Salinas, California. Revised 2004.

Moratto, Michael, Kevin Palmer, Clayton Lebow, M. Colleen Hamilton, and Wendy M. Nettles. 2005. "Vandenberg Air Force Base Integrated Cultural Resources Plan." *Volume 6 – Management of Historical Archaeological Resources*. Applied Earthworks, Inc., Fresno, California. December 2005.

National Aeronautics and Space Administration (NASA). 2009. *Integrated Cultural Resources Management Plan for Santa Susana Field Laboratory, Ventura County, California, January 2009-2013*. Manuscript. on file at George C. Marshall Space Flight Center, Huntsville, Alabama.

National Aeronautics and Space Administration (NASA). 2011. *Santa Susana Field Laboratory Environmental Cleanup and Closure: NASA Santa Susana Field Laboratory History*. http://ssfl.msfc.nasa.gov/cultural/ssfl-history.aspx. Accessed on February 23, 2012.

National Aeronautics and Space Administration (NASA). 2013. Memo for Record from Allen Elliott. NASA Property within SSFL Administrative Area I. March 25.

National Park Service (NPS). 1997. *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*. Finalized by Patrick W. Andrus. Edited by Rebecca H. Shrimpton. 1990, revised 1997.

National Park Service (NPS). 1998. *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. Prepared by Patricia Parker and Thomas F. King for the U.S. Department of the Interior, National Park Service. 1990. Revised 1992 and 1998.

National Park Service (NPS). 2000. Bulletin 36 *Guidelines for Evaluating and Registering Archeological Properties*. Prepared by Prepared by Barbara Little, Erika Martin Seibert, Jan Townsend, John H. Sprinkle, Jr., and John Knoerl for the U.S. Department of the Interior, National Park Service.

National Park Service (NPS). 2007. *Final Fort Hunter Liggett Special Resource Study*. National Park Service, Pacific West Regional Office Park Planning and Environmental Compliance. Oakland, California. January.

National Park Service (NPS). 2012. *Arlington Man.* http://www.nps.gov/chis/historyculture/arlington.htm. Accessed on April 26, 2012.

Native-Languages of the Americas. 2009. *Tataviam Language*. http://www.native-languages.org/tataviam.htm. Accessed on August 3, 2011.

National Register of Historic Places (NRHP). 2013. State Listings. California, Ventura County. http://www.nationalregisterofhistoricplaces.com/CA/Ventura/state.html. Accessed April 1, 2013.

Office of Historic Preservation. 1995. *Instructions for Recording Historical Resources*. Sacramento, California. March.

San Buenaventura Mission. 2013. The Old Mission San Buenaventura. *Mission History*. http://www.sanbuenaventuramission.org/history/mission-history. Accessed on June 26, 2013.

Simi History. 2011. History of Simi Valley. http://www.simihistory.com/Spanish.htm. Accessed on August 2, 2011.

Tartaglia, Louis James. 1976. Prehistoric Maritime Adaptations in Southern California. Ph.D. Dissertation. University of California, Los Angeles, California.

University of California. 2011. Survey of California and Other Indian Languages. *Tataviam*. http://linguistics.berkeley.edu/~survey/languages/tataviam.php. Accessed on August 3, 2011.

Ventura Weekly. 2005. *History of Ventura County*. http://www.venturaweekly.com/history/ventura-county-history. Accessed on August 2, 2011.

Wallace, William. 1955. "A Suggested Chronology for Southern California Coastal Archaeology." *Southwestern Journal of Anthropology* 11 (3): 214-230.

We Are California. 2011. Stories of Immigration and Change. *Conquest and Colonization: Spanish Missionaries*. http://www.weareca.org/index.php/en/era/1540s-1830s/spanish_missionaries.html. Accessed on August 2, 2011.

Weber, Tricia. 2006. California's Missions. *Mission Santa Barbara*. http://californias-missions.org/individual/mission santa barbara.htm. Accessed on August 2, 2011.



Representative	Appendix A Photographs

Appendix C, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup





Photo 1. Cultural Survey Overview, Northwest End in Area II



Photo 2. Survey Area Adjacent to Building 201



Photo 3. Overview of Survey Segment in Area II



Photo 4. Overview of Parking Lot in the Survey Area



Photo 5. Survey Area Within the Storable Propellant Area (SPA)



Photo 6. Overview of Disturbance in Survey Area



Photo 7. Overview of Area With Limited Visibility



Photo 8. Overview of Survey Area Within the Filtration Plant



Photo 9. Southern End of Survey Area (Area I) With Steep Terrain and Low Visibility

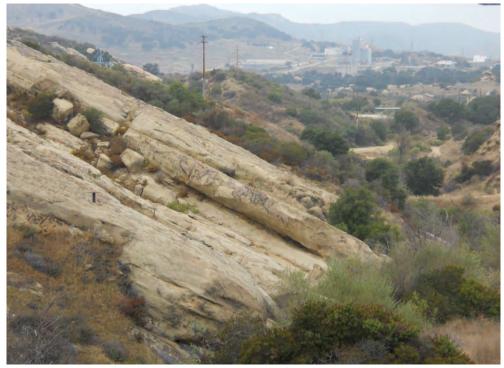


Photo 10. Overview of Survey Area South of Alfa Test Area



Photo 11. Overview of Survey Area and Disturbance



Photo 12. West of Coca Test Area, Concrete Drainage Running Parallel to the Road



Photo 13. Overview of Coca Test Area



Photo 14. Overview of Survey Area Adjacent to Service Road



Photo 15. Southern Survey Area, Overview From the Coca Test Area



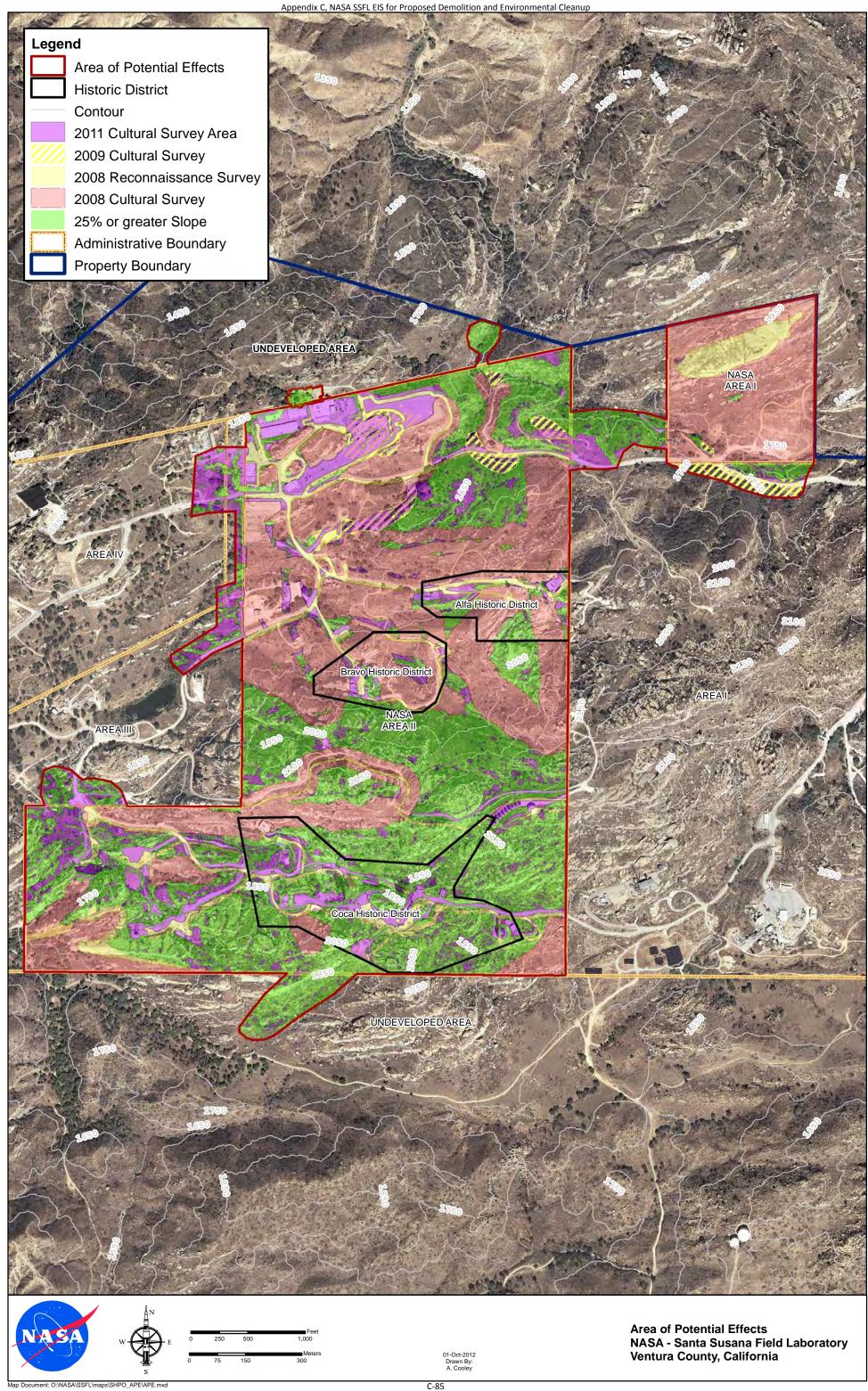
Photo 16. Overview of Survey Area, Within the Coca Test Area



Photo 17. Overview of Coca Test Area



Photo 18. Test Stand in the Coca Test Area



Appendix C, NASA SSFL EIS for Proposed Demolition and	Environmental Cleanup
	A
	Appendix B
	Consultation Record



TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
5/15/2008	SHPO	NASA	Historic Resources Survey and Assessment at SSFL	SHPO concurrence on the NRHP eligibility of Alfa, Bravo, and Coca historic districts.
12/16/2008	NASA	SHPO	Cultural Resources Inventory	Cultural resources inventory is submitted to SHPO for review and comment. Recorded one new site.
2/2/2009	SHPO	NASA	Review of and comment on Cultural Resources Inventory	SHPO is unable to concur with the finding that site CA-VEN-1800 is eligible for listing in the NRHP. SHPO recommends treating the site as potentially eligible.
4/23/2009	NASA	SHPO	Cultural Resources Inventory eligibility	NASA responded to SHPO's letter regarding the eligibility of site CA-VEN-1800. NASA agrees with SHPO's recommendation to treat the site as potentially eligible.
6/8/2011	NASA	NAHC	Request for California Native American Contact List	Letter requesting a list of recognized tribes in the SSFL area. The cleanup of SSFL could impact the Burro Flats archaeological area. NASA would like to get input from interested tribes.
6/10/2011	NAHC	NASA	California Native American Contact List	NAHC responded to NASA's request and sent NASA a list of names and contact numbers for Native Americans in Los Angeles and Ventura counties.
6/30/2011	NASA	15 letters to persons on the NAHC Contact List	Use of NEPA in lieu of Section 106 for SSFL demolition and cleanup of contaminated soil	NASA sent letters to the NAHC contact list notifying them of the undertaking, the EIS and NASA's intent to use NEPA in lieu of the Section 106 process. The letter included 6 maps: 3 overview graphics and the 3 maps of the historic districts.
6/30/2011	NASA	АСНР	Use of NEPA in lieu of Section 106 for SSFL demolition and cleanup of contaminated soil	NASA notified the ACHP of the undertaking and NASA's intent to use NEPA in lieu of the Section 106 process. Same attachments as 6/30/2011 letter to the NAHC contact list.
6/30/2011	NASA	SHPO	Use of NEPA in lieu of Section 106 for SSFL demolition and cleanup of contaminated soil	NASA notified the SHPO of the undertaking and NASA's intent to use NEPA in lieu of the Section 106 process. Same attachments as 6/30/2011 letter to the NAHC list.
7/6/2011	NASA	Public	Federal Register Vol 76, No. 129	NASA Notice 11-058. NASA Notice of Intent to conduct scoping and prepare an EIS.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
7/27/2011	АСНР	NASA	Notice of participation	ACHP responded to NASA indicating they would participate in the SSFL Demolition and Cleanup Section 106 consultation process.
8/3/2011	NASA	Memo for Record	Conversation with Freddie Romero	Record of conversation between Allen Elliott and Freddie Romero of the Santa Ynez. Mr. Romero asked about upcoming consultation meetings. He said the tribe would only be interested in private discussions with NASA.
8/5/2011	SHPO	NASA	Notice of participation	SHPO responded to NASA indicating they would participate in the SSFL Demolition and Cleanup Section 106 consultation process and requested an Area of Potential Effect (APE).
8/16/2011	Knight	NASA	Comments regarding the EIS for the former SSFL Area I	Significant structures should be considered for preservation as part of a potential historic district or park. Everything possible should be done to ensure the preservation of the entire Burro Flats site.
9/22/2011	NASA	SHPO, ACHP	Additional information on the undertaking	NASA sent SHPO and ACHP two documents (Historical Summary of Structures and Summary of Soil Remediation) with more detailed information on the demolition and cleanup activities at SSFL.
9/22/2011	NASA	Romero, Santa Ynez	Additional information on the undertaking	NASA sent Mr. Romero two documents (Historical Summary of Structures and Summary of Soil Remediation) with more detailed information on the demolition and cleanup activities at SSFL.
9/29/2011	АСНР	NASA	NEPA in lieu of Section 106	Acknowledges receipt of notification of adverse effect and NASA's intention to use NEPA in lieu of NHPA Section 106 process.
10/4/2011	NASA	Interested Parties	Notification of Section 106 information on the NASA SSFL website	NASA sent an e-mail to the people and organizations who had participated in the scoping process and who had expressed interest in the 106 process at that time, notifying them that NASA had added information to their SSFL website about the Section 106 process.
11/22/2011	NASA	Santa Ynez	Request plants or animals that are significant to the tribe	NASA asked the tribe if there were any plants or animals at SSFL the tribe considered significant for ceremonial reasons.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
11/22/2011	GSA	NASA	Section 106 consultation	GSA would like to attend the Section 106 consultation meetings for SSFL.
12/13/2011	Santa Ynez	NASA	List of flora and fauna	The tribe sent NASA a list of flora and fauna and the cultural significance of each to the tribe.
2/10/2012	NASA	11 Consulting Parties	Invitation to consulting party meeting	E-mail notification of the first Section 106 consultation meeting to be held 3/1/2012.
3/1/2012	NASA	Consulting Parties	Consulting Party Meeting Presentation	Power Point presentation of the 3/1/2012 consulting party meeting. Wayne Fishback also gave a brief presentation and gave out materials to the attendees in person.
3/1/2012	NASA	Consulting Parties	Consulting Party Meeting Sign-In Sheets	Sign in sheet from the people on site and the sign in sheet for all attendees; on-site and on the phone
3/19/2012	NASA	NAHC	List of Native Americans	NASA sent an e-mail to NAHC requesting an updated list of Native Americans in Ventura and Los Angeles Counties.
3/19/2012	NASA	Consulting Parties	Consulting Party Meeting Sign-In Sheet and presentation	NASA contacted the participants of the 3/1/2012 consulting party meeting to send them the sign in sheet and presentation.
3/19/2012	Rowe	NASA	Comments on SSFL Section 106 process	Chris Rowe sent a letter discussing the significant cultural and archaeological sites at SSFL, as well as the significant buildings and structures and her wishes for their preservation and protection.
03/22/2012	Bowling	SHPO	Response to NASA's request for comments in writing	E-mail and attachment from Bill Bowling regarding potential impacts to historic properties at SSFL. The document is headed ACME Aerospace Contamination Museum of Education. The letter discussed possible extensive contamination of the buildings and their carcinogenic potential.
4/2/2012	NAHC	NASA	Response to request for Native American list	NAHC sent the updated list of Native Americans in Los Angeles and Ventura Counties.
4/16/2012	Harris	NASA	Section 106 Committee Input	Letter from Dr. Elizabeth Harris commenting on cost considerations of soil cleanup at SSFL and the differences between the cleanup options presented at the 3/1/2012 meeting.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
5/7/2012	Bollinger	NASA	Value of preservation of some of the NASA test stands	Announcement of a presentation of the history of rocket engines, developed, built and tested at SSFL. Hopes educational presentations like this will help others understand the value of preserving NASA test stands at SSFL. Interested in NHPA Section 106 participation.
5/21/2012	NASA	SHPO	SSFL cleanup APE	NASA sent SHPO the updated SSFL demolition and cleanup APE, based on SHPO's earlier comments, for their review and comment.
5/21/2012	NASA	АСНР	SSFL cleanup APE	NASA sent ACHP the SSFL demolition and cleanup APE for their review and comment.
5/22/2012	NASA	Santa Ynez	NASA SSFL APE for review	NASA sent the APE to identify the area that would potentially be affected by the SSFL demolition and cleanup. NASA requested receipt of the APE and comments on the APE from the tribe.
5/25/2012	NASA	SHPO	SHPO request for hard copies; NASA response	NASA will send hard copies of the APE map attached to the 5/25/12 email.
5/29/2012	NASA	21 Consulting Parties	NASA SSFL APE for review	NASA sent the consulting parties the updated APE for their review and comment. This letter and APE map were sent to the 21 consulting parties at that time.
6/15/2012	NASA	Santa Ynez	Section 106 consultation	This is a follow up letter to Vincent Armenta regarding Section 106 participation in the SSFL demolition and environmental cleanup project. NASA invited input from the tribe and again invited them to participate in the Section 106 process.
6/19/2012	SHPO	NASA	APE follow up questions	SHPO responded to NASA's 5/21/2012 submittal of the APE with two questions regarding archaeological sites and the status of tribal consultations.
6/29/2012	NASA	SHPO	Response to questions regarding APE and tribal consultation	NASA's response to the archaeological question is confidential due to the sensitivity of the site. At this time, no federally-recognized tribes had expressed interest in participating in the Section 106 process.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
7/17/2012	NASA	Romero	Follow up to see if Santa Ynez want to participate in Section 106 consultation	Email to see if the Santa Ynez Council had decided they would like to participate in Section 106 consultation. Also inquired about sacred site status at SSFL.
7/21/2012	Santa Ynez	NASA	Informal request to be consulting party	Mr. Sam Cohen acknowledged receipt of an e-mail from NASA dated 5/25/2012. The tribe requested to be included in all Section 106 and other consultations regarding SSFL. They will send a formal request at a later date.
7/23/2012	NASA	Santa Ynez	Acceptance of informal request for consultation	NASA responded to the tribe's informal e- mail requesting consultation. NASA accepted their request.
8/7/2012	Larson	NASA	NASA funding for archaeological investigations	Dan Larson asked if NASA funding is available to complete the Compass Rose archaeological analysis of earlier collections gathered at Burro Flats from 1954 - 1960.
8/23/2012	NASA	24 Consulting Parties	SSFL Section 106 Consultation Meeting and Site Visit Summary	E-mail notification that the meeting summary from the 3/1/2012 meeting had been posted on the SSFL website. This record also includes the meeting summary.
8/23/2012	Walsh	NASA	Response to Section 106 Consultation Meeting and Site Visit Summary	Christina Walsh expressed concern that her views, which were stated at the meeting, were not represented in the meeting summary. She asked about how input will be considered and what can be done to save any structures.
8/24/2012	Larson	NASA	Response to NASA's e-mail regarding meeting notes	Dan Larson sent an e-mail in response to the meeting summary announcement. He suggested all of SSFL should be a discontiguous site, including some of Bell Canyon. He discussed the significance of Burro Flats.
9/19/2012	Santa Ynez	NASA	Request for consultation	The tribe is requesting NHPA Section 106 consultation with NASA. The tribe requests their consultation not be open to the public.
9/24/2012	NASA	Consulting Parties	Notification of next consulting party meeting	NASA notified the 25 consulting parties of NASA's intent to meet by phone on 10/30/2012. NASA reiterated that comments on the undertaking should be submitted to NASA in writing and supplied several electronic and regular mail addresses.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
10/1/2012	NASA	SHPO	SSFL final APE	NASA sent SHPO the APE with the survey areas and requested final comments on the SSFL demolition and cleanup APE.
10/17/2012	Bowling	NASA	Section 106 comments	The attached comments were from ACME. The structures at SSFL sit on cancerous solvents and are covered with lead paint. The only way to discover the extent of the contamination is removal of the buildings.
10/18/2012	NASA	Consulting Parties	Announcement of 10/30/2012 consulting party meeting	NASA e-mailed the consulting parties to announce the 10/30/2012 consultation meeting via teleconference. Based on an earlier request, the names of the consulting parties were attached to the e-mail.
11/01/2012	Weitzberg	NASA	Comments from the 10/30/2012 consulting party meeting	Supportive of the NEPA in lieu of Section 106 process. Emphasizes the need to minimize impacts and adverse effects on historic properties. Concerned that the AOC is not conducive to preservation of cultural resources.
11/18/2012	Bollinger	NASA	Comments from the 10/30/2012 consulting party meeting	Comments discuss an overview of SSFL, Native American cultural assets, and rocket engine test stands. Need evaluation studies to determine which test stands are feasible to preserve. A combined cultural and rocket space museum including Native American culture would be beneficial.
11/19/2012	NASA	Consulting Parties	Summary of Issues Raised at the consulting party meeting	E-mail with the meeting summary attached. Listed attendees at the 10/30/2012 meeting. Included a bullet list of issues discussed at the meeting. Requests written comments by 12/1/2012.
12/03/2012	NPS	NASA	Comments on the environmental cleanup and demolition at SSFL	Support efforts to protect known and unknown Native American archaeological sites. Recommends the EIS explore options for preserving the test stands for education and interpretation. Preservation of historic resources should be an alternative in the EIS. The EIS should include costs of stabilizing and maintaining the test stands. NPS special resource study for the Rim of the Valley Corridor is under way. SSFL is within the study area.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
12/03/2012	SHPO	NASA	Demolition and Cleanup Activities at SSFL	Written statement of concerns regarding the undertaking. The EIS should include a clear Purpose and Need statement, and explanations of the Proposed Actions, including excess property declaration. NASA should consider the possibility of an archeological district. Urges NASA to reinstate consideration of alternatives that don't result in 100 percent demolition of structures.
12/06/2012	Rowe	NASA	SSFL Section 106 consultation comments	Very important to keep the archeological sites protected and that Native American monitors be used during the sampling and remediation phases. Support the use of local archeologists. SSFL should be considered in its historic context as a whole, not just NASA areas. Supports cleaning up to Residential standards.
12/14/2012	Bowling	NASA	SSFL Section 106 consultation comments	Need to make sure the watershed is cleaned up as it is a tributary of the Los Angeles River. Wants to ensure proper cleanup of SSFL. A decision on demolition or preservation cannot be made until the extent of contamination is known.
01/02/2013	Tejada	NASA	SSFL Section 106 consultation comments	Disappointed that NASA only considering alternatives consistent with AOC. Archeological monitoring should be included in early soil testing activities and throughout the process. Produce an ethnographic study of the area; Burro Flats may be a TCP. Would like to preserve at least one test stand. Proponent of SSFL becoming parkland within the Rim of the Valley Corridor.
01/31/2013	NASA	Consulting Parties	October 2012 meeting notes	Announcement that the finalized meeting notes were posted on the SSFL website and the link to the site.
02/28/2013	NASA	Consulting Parties	Notice of Consulting Party Meeting on 3/15/2013	Announcement of the next consulting party meeting to be held at SSFL on 3/15/2013. The main topic will be the proposed Traditional Cultural Property study, to be conducted based on previous consulting party input.
03/05/2013	NASA	Consulting Parties	Agenda for Consulting Party Meeting on 3/15/2013	Attached the agenda for the consulting party meeting on 3/14/2013, including the call-in number and conference call code.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
03/13/2013	NASA	Consulting Parties	Brochure for Consulting Party Meeting on 3/15/2013	Attached a brochure on Traditional Cultural Properties to be discussed at consulting party meeting on 3/15/2013.
03/15/2013	NASA	Consulting Parties	Meeting materials for Consulting Party Meeting on 3/15/2013	Includes agenda, NASA TCP brochure, Wayne Fishback Presentation, and Christina Walsh presentation.
4/8/2013	Rowe	NASA	Re: NASA Section 106 Comments	Clarification about Section 106 comment. Keep the test stands if possible for their historic significance and the affiliated structures. Also keep the structures if more harm would be done to the sandstone outcroppings by removing them.
4/9/2013	NASA	CPs	Last call for recommendations for TCP study interviews	Reminder to send Jennifer Groman any recommendations for people to interview as part of the TCP study.
4/9/2013	Cohen	NASA	Last call for recommendations for TCP study interviews - response	Cohen of Santa Ynez Chumash sent a list of recommended names to be interviewed for the TCP study. Provided a list of names and their contact information.
4/9/2013	Kidd	NASA	Last Call: Recommendations for the TCP study interviews - response	Attached list (2Consult.doc) of possible Native American consulting individuals and agencies (included name, organizational affiliation, tribal affiliation)
4/9/2013	Luker	NASA	Last Call: Recommendations for TCP Study interviews	Recommendation to interview Beverly Folkes, Al Knight, and John Luker
4/9/2013	Salazar	NASA	Re: Last Call: Recommendations for TCP study interviews	Request to be placed on the list of recommended names to be interviewed for the TCP study.
4/12/2013	Kidd	NASA	Last Call: Recommendations for TCP Study interviews	Recommendation to include Simi Valley City Historian.
4/18/2013	Tejada	NASA	Re: Last Call: Recommendations for TCP study interviews	Recommendation to include 8 more people to be interviewed for the TCP study.
4/24/2013	John R. Johnson (UC Santa Barbara)	Cohen	Individuals of documented Chumash/Fernandeño ancestry	A list of individuals of documented Chumash and/or Fernandeño ancestry who may have direct knowledge of and/or cultural affiliation with the Santa Susana area regarding the TCP study, per Cohen's request.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
5/1/2013	NASA	Santa Ynez	APE for the Environmental Cleanup of SSFL, NASA Areas I and II, Ventura County, California	Consultation with Santa Ynez to update the previous identified APE to historic properties from the mandated environmental cleanup at SSFL. Correspondence addresses two issues: a 9-acre APE expansion and potential changes to the soil cleanup footprint. Three figures are included as attachments.
5/1/2013	NASA	Beason	CA SHPO File NASA 110705A; Updated APE for the Environmental Cleanup of SSFL, NASA Areas I and II	Consultation with SHPO to update the previously identified APE to historic properties from the mandated environmental cleanup at SSFL. Correspondence addresses two issues: a 9-acre APE expansion and potential changes to the soil cleanup footprint. Three figures are included as attachments.
5/15/2013	NASA	Consulting Parties	Draft 3/15/2013 meeting notes	Copy of the draft notes from the 3/15/2013 meeting for comment.
5/15/2013	Romero	NASA	SSFL conversation	Concurrence with NASA and proposed scope of work for the soil sampling in Area II. Will make the following recommendations to the Elders Council: scope of work plan for review, NA advisor during all ground disturbing activity, handling and treatment plan for archaeological discoveries.
5/20/2013	SHPO	NASA	Re: Comments on Archaeological Property Identification at SSFL, Ventura County, CA	SHPO finds the identification and evaluation of archaeological resources to be insufficient. SHPO requests NASA conduct additional studies prior to the issuance of the Draft EIS. Requests the archaeological survey data be revisited and more areas identified for further investigations. Also, should look into the possible presence of an archaeological district. A new DRP 523 form needs to be prepared that reconciles all of the previous recordation efforts for the Burro Flats.
5/30/2013	NASA	SHPO	May 2013 SHPO Comments on NASA SSFL Archaeological Property	Notifying Stratton that NASA submitted two reports that demonstrate that NASA completed a 100 percent survey of the APE. Confirms that NASA has met the obligations under 36 CFR 800.4 for archaeology and historic properties.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
5/31/2013	Bowling	NASA	SSFL Section 106 consultation comments	Raised concern about ensuring the proper cleanup of the SSFL, its related facilities, and their surrounding communities. Believes that the SSFL is being treated like a park before it is a clean-closed facility.
7/16/2013	NASA	NASA	Conversation Record with Freddie Romero	Freddie had a few concerns about the Cultural Resources report: only six flora and six fauna were mentioned (should be more) and Chumash language should be described as an isolate. Protection measures were discussed and he suggested other tribes should be represented during the visit site on 8/29/2013.
7/18/2013	NASA	Rosas	Re: SSFL TCP and Cultural Landscape Study	Response to concerns regarding goals of the TCP study and interviews. Any questions regarding the studies, Groman will try to answer or will forward them to the team to answer.
8/2/2013	NASA	Consulting Parties	Draft EIS and August meeting of SSFL Consulting Parties	Notice of Availability for the SSFL Draft EIS was announced in the Federal Register. Provides the website to access the draft and to submit comments. Announces the next Consulting Parties meeting (8/29/2013).
8/20/2013	NASA	Consulting Parties	SSFL: Extension of Public Comment Period for SSFL Draft EIS to October 1, 2013	In response to request from members of the public, the public comment period will not close until 10/1/2013 (extended by 15 days). Provides instructions on how to submit comments on the NASA Draft EIS.
8/26/2013	Weitzberg	NASA	Draft EIS Comments	Concerned with the contents of the Draft EIS and the negative impacts of the two (extreme) alternatives. Draft EIS is not realistic about impacts of the soil remediation. There would be excessive environmental effects of the soil removal and transport to meet the requirements of the 2010 AOC.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
8/29/2013	Compass Rose	NASA	NASA Consultant Meeting Comments	Comments address several issues: boundaries of TCP, establishing ESAs, mitigation measures and implementation of the ROD. Compass Rose would like to see all nine of the test stands preserved. Strict cleanup guidelines to "background" levels in the 2010 AOC are inappropriate for proper protection of the historic properties within Area II. Cleanup should be to "residential". Additionally, from the beginning there should not have been two separate processes (Boeing and NASA) since the SSFL is a continuous landform with a continuous history.
9/5/2013	NASA	Consulting Parties	9/11/2013 NASA SSFL Consulting Party Call	Meeting will focus only on Architectural Resources (historic structures) and the significant impacts and adverse effects of the proposed action. Provides links to materials which will be informative for the meeting.
9/8/2013	Rowe	NASA	Archaeological Survey and CEQA comments	Disappointed in the cultural resources documentation; recommends using a local archaeological firm. Does not support excavation of archaeological resources for research purposes. Consulting firm should agree to preservation in situ of archaeological materials. Site boundaries should be reviewed and formally excavated; Burro Flats should be permanently fenced in, and further archaeological monitoring will be required after any vegetation is removed.
9/9/2013	SSMPA	NASA	Public Support to Maintain NASA/SSFL Land as Open Space and Parkland	Concerned about the final disposition of the NASA land that is in the 'disposal process.' Many people and organizations have signed the petition agreeing that the NPS would be the best steward for this land. Includes petition letters and signatures.
9/12/2013	NASA	Consulting Parties	NASA SSFL Consulting Parties Meeting Sept 20th	NASA scheduled next consultation party meeting for 11 am, Pacific time, Friday 9/20/2013. There will be a tour of the test stands area at 9 am.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
9/30/2013	NASA	Consulting Parties	10/10/2013 NASA SSFL CP Call Invite	Next CP meeting is scheduled for Thursday 10/10/2013. Includes logistical conference call information. Another email in the coming week will include more follow-up information to help participants prepare for the meeting.
10/1/2013	NASA	Consulting Parties	NASA SSFL Draft EIS Comment Period Closes Tonight October 1	NASA is currently closed due to lapse in government funding. Public comment period for NASA's SSFL Draft EIS ends at midnight Pacific Time on 10/1/2013. Comments can be submitted electronically or in writing. NASA cannot respond to inquiries during the furlough period.
10/9/2013	NASA	Consulting Parties	10/10/2013 NASA SSFL Consulting Party Call Cancelled	The 10/10/2013 NASA SSFL Consulting Party Call has been cancelled.
10/22/2013	NASA	Consulting Parties	Nov 1st NASA SSFL Consulting Party Call Invitation	Rescheduling the Section 106 Consulting Parties meeting that was cancelled during the federal government shutdown. Meeting will now be a face-to-face meeting on Friday, 11/1/2013 at SSFL. Communication includes call in information for those who cannot attend in person.
10/23/2013	Swindall	NASA	SSFL cleanup Draft EIS comment	Site is very important to the Chumash. Before construction and disturbance a trained Native American monitor must be present to assess for human remains or artifacts. Requests to work with NASA and voice their opinion as a Tribe regarding the construction and potential for damage.
11/11/2013	Klea	NASA	Response to NASA	She would not like to participate as a Section 106 consulting party.
11/11/2013	NASA	SHPO, ACHP	Draft PA review	NASA added another stipulation to the draft PA and resent for review and comment.
11/12/2013	АСНР	NASA	Draft PA review	Comments from the ACHP on the draft PA. Comments were in the word document in track changes.
11/13/2013	NASA	Santa Ynez	Draft PA review	NASA submitted the Draft PA to the Santa Ynez for review and comment.
11/13/2013	NASA	GSA	Draft PA review	NASA submitted the Draft PA to the GSA for review and comment.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
11/13/2013	NASA	SHPO	Draft PA review	NASA sent an updated version of the draft PA with comments from ACHP and GSA incorporated for additional review and comment.
11/14/2013	NASA	Gortner	Response to inquiry about becoming a Section 106 consulting party	NASA explained the process for becoming a Section 106 consulting party and sent the NASA link to the application.
12/6/2013	NASA	SHPO, ACHP, Santa Ynez	Delivery of TCP study	NASA submitted the Draft TCP and cultural landscape assessment to SHPO, ACHP and the Santa Ynez for review and comment. This document is confidential.
12/16/2013	NASA	SHPO, ACHP	Draft PA review	NASA sent an updated version of the draft PA with additional comments from ACHP, GSA and Santa Ynez for another round of review and comment.
12/16/2013	SHPO	NASA	Comments on the Draft PA	SHPO has serious concerns about the PA. SHPO cannot sign the PA as it is currently written and will need additional time to compile comments.
12/17/2013	АСНР	NASA	Response to NASA questions regarding PA	Discusses mitigation for impacts to the TCP. NASA needs to consider the comments it has received before making a decision about the appropriate mitigation for the effect on the TCP. Also talks about the procedure if one of the parties does not sign the PA.
12/19/2013	NASA	CPs	Draft PA review	NASA submitted the Draft PA to the consulting parties for their review and comment. NASA asked for comments back from the consulting parties by Friday, 1/10/2014. Notifies them that if agreement cannot be reached with the signatories prior to completion of the Final EIS, the PA or its contents will be included in the ROD.
12/19/2013	NASA	CPs	Draft PA review clarification	Correction to the previous email submitting the PA for review. The PA does not include the Coca Historic District in the demolition deferral clause.
12/19/2013	Salazar	NASA	Comments on the Draft PA	If NASA has an archeologist on the SSFL site determining the size of the Burro Flats site and if there are other sites Chumash consultants should be with them and part of their team
12/20/2013	Romero	NASA	Request to extend deadline	Request to extend the deadline for comments on the Draft PA.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
12/20/2013	NASA	CPs	Time Extension on Draft PA review	Email to consulting parties extending the deadline for comments on the Draft PA from 1/10/2014 to 1/17/2014.
12/20/2013	Walsh	NASA	Comments on the Draft PA	The PA should be included in the Final EIS.
12/23/2013	Weitzberg	NASA	Comments on the Draft PA	If DTSC are to employ risk in their determinations it should also be employed not to remove any soil for which there is negligible risk.
1/16/2014	Kidd	NASA	Comments on the Draft PA	Disappointed that the Coca Historic District would be demolished, but understands their condition and other factors. Volunteers to be interviewed about working at Rocketdyne. Asked about additional Consulting Party meetings or consultations.
1/16/2014	NASA	SHPO	Conference Call Meeting Request	NASA would like to meet with SHPO to discuss comments on and concerns about portions of the Draft PA.
1/17/2014	Bowling	NASA	Comments on the Draft PA	Asks NASA to clean up the Coca area to background levels in accordance with the AOC. The contamination below the test stands that are proposed to stay in place will hinder a proper clean up and need to be addressed.
1/17/2014	Larson	NASA	Comments on the Draft PA	NASA, in cooperation with Boeing, should formally nominate SSFL as a Historical/ Archaeological District. PA statements mentioning Native American monitors within TCP, should include qualified archaeologists. NASA should include specialist studies as mitigation. NASA and Boeing should provide funding for the analysis and report of the 1953, 1954, 1959, and 1960 Burro Flats.
1/17/2014	Collins	NASA	Comments on the Draft PA	Comments disagree with the TCP designation and is concerned that the designation will cause NASA to fail to clean up the site as required by the AOC. All structures in Alfa, Bravo, and Coca should be demolished.
1/17/2014	Fishback	NASA	Additional time to review the PA	Requesting additional time beyond the already extended 1/17/14 deadline to review and comment on the Draft PA.

TABLE B-1
Summary of Section 106 Consultation Record
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
1/17/2014	Fishback	NASA	Comments on the Draft PA	Would like to preserve the Coca Test Stands. Does not agree with the reasons cited by the tribes for their preference to demolish the Coca Test Stands. Making the entire NASA site a TCP nullifies the Section 106 process and transfers control of historic preservation to NASA and Native Americans. There is also a change from transparency to secrecy.
1/17/2014	LanVen (Tejada, Brown, Luker)	NASA	Comments on the Draft PA	DTSC should be included as a signatory. ACHP role not defined in the PA recitals. Related topics should be grouped in recitals. LanVen is concerned about NASA's level of effort in identifying historic properties. An ethnographic study should not be considered mitigation. Recommends archeological and Native American monitors during sampling activities. There are many other very specific comments on the document.
1/17/2014	Luker	NASA	Comments on the Draft PA	The PA appears hastily written. Would prefer to see at least one Coca Test Stand retained. He hopes that NASA, DOE, Boeing and DTSC would combine efforts at SSFL and work toward a PA that is achievable and preserves our irreplaceable cultural and historic assets.
1/17/2014	Osokow	NASA	Comments on the Draft PA	From the San Fernando Valley Audubon Society (SFVAS). SFVAS is disappointed with the Section 106 consulting process, which did not include discussion of a critical activity affecting wildlife at the site. Also very concerned about the fence put up in the Burro Flats and the process by which that occurred. Adverse impacts on historic properties have not been resolved.
1/17/2014	Rowe	NASA	Comments on the Draft PA	Various parties (NASA, DOE, DTSC, Boeing, GSA, SHPO, ACHP, NAHC, and tribes) should come up with a new agreement to replace the 2010 AOC. Are the AOC's predecisional under NEPA, Section 106, CEQA, and other applicable laws? Many other questions were asked and statements made in this letter.

TABLE B-1 **Summary of Section 106 Consultation Record**

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	То	Subject	Summary
2011 - 2013	Consulting Parties	Consulting Parties	Applications and acceptance to become Section 106 consulting party	Applications sent to NASA to be a Section 106 consulting party for the SSFL demolition and cleanup project. NASA's responses to the requesting parties to become Section 106 consulting parties for the SSFL demolition and cleanup project.

Notes:

ACHP = Advisory Council on Historic Preservation

AOC = Administrative Order on Consent

APE = Area of Potential Effects EIS = Environmental Impact Statement

NAHC = Native American Heritage Commission

NASA = National Aeronautics and Space Administration

NEPA = National Environmental Policy Act

NPS = National Park Service

SHPO = State Historic Preservation Officer SSFL = Santa Susana Field Laboratory

SSMPA = Santa Susana Mountain Park Association

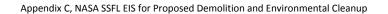
TCP = Traditional Cultural Property

Consultation record through January 17, 2014.

Comments from the EIS Scoping process and comments on the Draft EIS are not included.

Project Personnel	Appendix C Qualifications

Appendix C, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup



Cultural Resources Specialist CH2M HILL Santa Ana, California

Education

M.A., Anthropology, California State University, Fullerton, 2005 B.A., Anthropology, California State University, Los Angeles, 1999

Professional Registrations

Register of Professional Archaeologists (2005, No. 15777) Riverside County Cultural Register (2007, No. 158)

Distinguishing Qualifications

Meets Secretary of Interior Professional Qualification Standards (36CFR61) California BLM Cultural Use Permit (*CA-10-31*)

Relevant Experience

Ms. Cardenas has participated in California archaeology since 1998. She completed her Masters degree in Anthropology at California State University, Fullerton with an archaeological thesis dealing with Southern California prehistoric architecture and the use of household space. Ms. Cardenas has 7 years of experience in cultural resource management, Phase I, II and III investigations, supervision and directing field crew, laboratory processes, curation, artifact analysis, research, and report writing. Projects have been conducted throughout the American Southwest and have involved renewable energies, gas and electric, private developers and military installations in cooperation with agencies such as BLM, California Energy Commission, US Army Corps of Engineers, Native American Tribes, SHPO, and the U.S. Department of Defence. Archaeological investigations for renewable energies have focused in Florida, Georgia, Oklahoma, Texas, New Mexico, Nevada, Arizona, Colorado, and California. Investigations have been conducted in support of state and federal legislature such as Section 106 and 110 of the NHPA, CEQA, and NEPA. Ms. Cardenas meets the Secretary of the Interior's Standards for Qualifications for Archaeologists.

Professional Positions Held

Cultural Resources Specialist, 2008- Present Project Archaeologist, 2006-2008 Crew Chief, 2005-2006 Research Assistant, 2004-2005

Project Experience

AES-Southland System Repowering Application for Certification. Cultural Lead for three projects, Huntington Beach Generating Station, Redondo Beach Generating Station and Alamitos Generating Station. Lead was responsible for archaeological assessment, pedestrian survey, and report of findings in support of CEQA, PRC Chapter 2.6, Section 21083.2 and 21084.1, and the California Code of Regulations (CCR) Title 14, Chapter 3, Article 5, Section 15064.5, and author for cultural documents for the Application for Certification with the California Energy Commission,.

National Aeronautics and Space Administration (NASA), Santa Susana Field Laboratory, Areas I and II, Ventura County, California. Cultural Lead responsible for survey, assessments, the Cultural Section of

C-107

1

the Environmental Impact Statement in support of NEPA, and the Archaeological Resource Management Report.

Federal Emergency Management Agency for the City of Moreno Valley, San Timoteo Foothill Neighborhood Flood Protection Project. Cultural Lead of an archaeological investigation and consultation in support of Section 106.

Cal Energy Black Rock 5 and 6 Geothermal Project, Imperial County, California. Cultural Resources Lead responsible for archaeological assessment, pedestrian survey, cultural documents and report of findings in support of CEQA, PRC Chapter 2.6, Section 21083.2 and 21084.1, and the California Code of Regulations (CCR) Title 14, Chapter 3, Article 5, Section 15064.5, and the Application for Certification with the California Energy Commission.

Los Angeles World Airports, Los Angeles International Airport, California. Cultural Resources Lead responsible for the monitoring activities and personnel for the modernization activities of Taxilane S and Bradley West projects. Author of technical report.

First Wind, LLC, Painted Hills IV Project, Riverside County, California. Field Director responsible for a cultural resources survey of 400 acres in support of CEQA and the County of Riverside's General Plan, for a proposed wind turbine facility on private land. Responsibilities included being permitted with the County of Riverside, leading the intense pedestrian survey, data management and authoring the technical report.

Solar Reserve, LLC, Rice Solar Energy Project, Riverside County, California. Cultural Resources Specialist and primary author for the Cultural Resources Monitoring and Mitigation Plan.

TerraGen Power, LLC, Alta Infill II Wind Energy Project, Kern County, California. Field Director responsible for a Class III cultural resources survey of 810 acres for a proposed wind turbine facility and testing and evaluation of a prehistoric lithic site. Responsibilities included producing a cultural survey report and testing report. Work was conducted in April and June of 2011.

TerraGen Power, LLC, Morgan Hills Wind Energy Project, Kern County, California. Field Director responsible for a Class III cultural resources survey of 1,200 acres. This cultural resources inventory was conducted in compliance with the California Environmental Quality Act (CEQA) as part of an application to Kern County for a Conditional Use permit to construct and operate the Morgan Hills project. Work was done in April and May of 2011.

Contra Costa County Generating Station, LLC, Oakley Generating Station Project, Contra Costa County, California. Cultural Resources Specialist, Alternate and co-authored the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission. Work was done in January 2011.

TerraGen Power, LLC, Loma Verde Solar Energy Park, Riverside County, California. Field Director responsible for a Class III cultural resources survey of 1,000 acres for a proposed PV solar energy generation field. Property was comprised of both private and public lands, the latter is administered by the BLM. Work was conducted in December 2010.

NextEra Energy Resources, LLC, North Sky River Wind Project, Kern County, California. Cultural Resources Specialist involved in a Class III cultural resources survey on public lands administered by the BLM under Use Permit No. CA-10-31. Responsibilities for this project included, analysis of previous studies, systematic pedestrian survey, documentation of new discoveries, data management, and contributions to the technical report. Work was conducted between October and November 2010.

Mariposa Energy Project, Alameda County, California. Ms. Cardenas was the Cultural Resources Specialist, Alternate and co-authored the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission. Work was done in January 2011.

New River Siphon Project for the All American Canal, Calexico, California. Ms Cardenas conducted a cultural resources archival literature search for historic and archaeological resources with the CHRIS center. Work entailed an analysis of findings, evaluation of a bridge for the NRHP listing and a "critical issues" report. Work was done in January 2011.

Turlock Irrigation District, Almond 2 Power Plant, Stanislaus County, California. Ms. Cardenas was the Cultural Resources Specialist, Alternate and co-authored the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission. Work was done in January 2011.

Cedar Point Windfarm, Lincoln and Washington Counties, Colorado. A literature search was conducted with the Colorado Historical Society Office of Archaeology and Historic Preservation and the report of findings was written in December 2010.

SNG Suwannee Pipeline Project, Alabama, Georgia and Florida. Ms Cardenas conducted a cultural resources archival literature search for historic and archaeological resources with the cultural resources repositories in each state. Work entailed an analysis of findings and a "critical issues" report. Work was done in November 2010.

Ivanpah Solar Generating Station, San Bernardino County, CA. Ms. Cardenas participated in additional field studies of several locations around the Ivanpah SEGS project area, including pedestrian survey and site recordation in September 2008 and was the Alternate Cultural Resources Specialist and co-author for the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission and BLM in November 2010.

Southern California Edison (SCE), Tehachapi Renewable Transmission Project (TRTP) – Segments 4-11 Compliance Monitoring. Environmental Scientist involved in photo documentation of transmission line to support post construction restoration. The TRTP includes construction of new and upgrade of 173 miles of transmission lines, construction of one new substation, major upgrade of one existing substation and upgrade of other ancillary facilities. Work was done from July to October 2010.

Southern California Edison (SCE), Devers Palo Verde No. 2 Transmission Line Project. Environmental Scientist involved in environmental compliance support and development in mitigation plans in support of CPUC requirement. Ms. Cardenas's role on this project involved authoring plans to address CPUC traffic, construction specifications, and cultural resources in response to regulatory requirements, as well as contributions in research for biological restoration, Storm Water Pollution Prevention Plans, construction scheduling and agencies' responsibilities. Work was done from April to July 2010

Phase II Cultural Resources Evaluation of 30 Sites at Edwards, Air Force Base, California. FY09 and FY10 2009-L. Ms Cardenas was Principal Archaeologist and Director of Field and Laboratory, responsible for research design and evaluation of 30 sites consisting of historic refuse deposits, homesteads, and prehistoric camp and lithic deposits, in the Western Mojave Desert. Other project duties included setting up the laboratory facilities, creating project specific documentation forms, the implementation of procedures and training of 6 technicians in lab as well as field methods, site updates (DPR forms) for 30 sites, and report writing. The project was conducted in support of Section 106 and 110 of the National Historic Preservation Act of 1966, as amended, and Air Force Instruction 32-7065, Cultural Resource Management. JT3/CH2M HILL conducted the evaluation under Letter of Technical Direction

3

1B0220000-0001, Environmental Management Support, as part of contract F042650-01-C-7218, under the command of the Base Historic Preservation Office.

2009-K-PLT42 Phase II Cultural Resources Evaluation of Site EAFB-3897, Air Force Plant 42, Los Angeles County, California. FY09. Project and Field Director for the test excavation and evaluation of a Gypsum Period temporary camp site. Responsibilities included, but were not limited to, coordination with Air Force Plant 42 security personnel, training of field technicians, creation and implementation of procedures for project design and methods, and writing the final report of findings. The project was conducted in support of Section 106 and 110 of the National Historic Preservation Act of 1966, as amended, and Air Force Instruction 32-7065, Cultural Resource Management. JT3/CH2M HILL conducted the evaluation under Letter of Technical Direction 1B0220000-0001, Environmental Management Support, as part of contract F042650-01-C-7218.

Archaeological Inventory FY09 2009-D, Edwards AFB, California. Archaeologist involved in Phase I investigation of 2500 Acres on EAFB, in support of the continued base-wide inventory. Work was conducted in accordance with the Integrated Cultural Resources Management Plan, under the command of the Base Historic Preservation Office.

2009-C Protection of Historic Properties, Edwards AFB, California. Archaeologist involved in support of site preservation to assist the Air Force in complying with the provisions of the National Historic Preservation Act, as amended; the Archaeological Resource Protection Act; Native American Graves Protection and Repatriation Act; American Indian Religious Freedom Act; and Air Force Instruction 32-7065, Cultural Resource Management. Work was conducted for the Site Preservation Program for Fiscal Year 2009, as specified in Letter of Technical Direction 1B022000-0001-R2, Environmental Management Support, as part of Contract F42650-01-C-7218.

Old Ridge Route Project, in the Angeles National Forest, California. Client Federal High Way Administration. July 2008 to September 2008. Archaeologist involved in the monitoring of the emergency repair of Federally Owned Roads upon the NHPA listed Old Ridge Route, 8N04.

Modesto Irrigation District, 49 MW Power Plant Project, Modesto, California. Client: Modesto Irrigation District. August 2008. Archaeologist responsible for a Phase I pedestrian survey for a 49-megawatt power plant, a cultural inventory search, and contributions to the report.

Iberdrola Renewables Biological and Cultural Assessment Support Project. Client: Iberdrola Renewables. Ms. Cardenas was responsible for conducting cultural inventories, fatal flaw reports, and field reconnaissance studies. Ten sites were evaluated for solar power plants for possible acquisitions in California, Nevada, Arizona and New Mexico. Five study areas of this overall project are located in Arizona; two are in Maricopa County, two are in La Paz County, and one project is located partially in La Paz and Yuma Counties. Project acreages range from 5,800 acres to 35,000 acres. Three of these study areas are located in California; two areas are in San Bernardino County and one is located in Imperial County. Project acreages range from 13,000 to 29,000. Three of these study areas are located in Nevada; two are in Nye County and one is located in Clark County. Project acreages range from 7,500 to 12,000. The remaining study area is located in Hidalgo County, New Mexico. Total acreage of this project is 25,000. Work was conducted in July through September of 2008.

Experience Prior to CH2M HILL

Chocolate Mountains Aerial Gunnery Range, Seal Weapons and Tactics Areas 4 and 5, Imperial and Riverside Counties, California. Client: U.S. Navy, San Diego, CA. January 2008 to April 2008. Archaeologist during a Phase I pedestrian survey of 2 areas encompassing 2,200 acres within the Naval Special Warfare Desert Training Facility. Duties included recordation of transects, GPS, field notes and documentation of discoveries, photography, DPR forms, and report writing in accordance to Section 106 guidelines.

Noble Windpark Project, Great Plains, Texas. Client: Noble Environmental Power. Archaeologist during a Phase I survey of a transmission right-of-way the length of which was approximately 8 miles. Other duties included report writing in accordance with the National Historic Preservation Act, Section 106 guidelines.

Noble Mitchell County Wind Farm, Mitchell, Coke, and Sterling Counties, Texas. Client: Noble Environmental Power. Researcher responsible for conducting a cultural inventory search with the Texas Historical Commission and the National Register of Historic Places. Duties also included producing the report of findings.

Mid County Parkway, Riverside County, CA. Client: Caltrans District 8. November 16, 2007 to January 4, 2008. Archaeologist and Field Supervisor for a Phase II investigation of 9 Prehistoric sites CA-RIV-1512, 1650, 6989, and 8712, as well as 33-16678, 33-16679, 33-16680, 33-16685, and 33-16687. The nine sites investigated were comprised of milling stations in granite outcrops with surface artifacts, quarries, habitation, and multi-used sites. Evaluations are pending for potential of eligibility for the National Register of Historic Places and the California Register of Historical Resources. Responsibilities changed with the needs of the project and were site specific, but everyday duties included crew management, field direction, data management, documentation, collection and transportation of artifacts, analysis, evaluation of site boundaries and placement of STPs, surface collection grids, test units, surface scrape units, and the write-up of weekly reports, analysis and the report write up for ground stone artifacts.

Planning Area 6, Neighborhood 4A, Phase 2 Residential, Irvine, CA. Client: The Irvine Community Development Company (ICDC). January 1, 2007 – November 16, 2007. Project Archaeologist responsible for archaeological discoveries found during rough grade activities. Duties included, but were not limited to hiring technicians, coordination, site inspections, scheduling, managing documentation and finds, GIS, field direction in securing finds/sites, testing, excavation, collection, laboratory processing and curation of artifacts, weekly discoveries report to Army Corps Of Engineers, and technical report writing. Data recovery sites were CA-Ora-244, locus G with twenty three 2-by-2 meter units and PA6-15 with six 2-by-2 meter units. All units at site 15 contained thermal features.

Planning Area 40, Irvine, CA. Client: The Irvine Community Development Company (ICDC). May 2007. Project archaeologist for on call services for site inspection, resource impact analysis and field monitoring. A complete record search at a CHRIS information center was conducted using the following resources: Historical USGS and other historical maps, National Register of Historic Places, California Register of Historical Resources, California Inventory of Historical Resources, California State Historical landmarks, Directory of Properties in the Historical Resources Inventory, and quad maps showing survey footprints, sites, and isolates.

The Irvine Company, Portola Springs (Planning Area 6 Phase II) Data Recovery Irvine, CA. Client: The Irvine Community Development Company (ICDC). December 2005 to June 2007. Project Archaeologist responsible for the supervision of 6 lab technicians, training new personnel in artifact analysis, database quality control, ground stone analysis and its corresponding chapter for the report, data management, photo archiving, further contributions to the technical report included field, wet screen and analysis methods, and an appendix for the site records which were submitted to the CHRIS information center.

The Irvine Company, Portola Springs (Planning Area 6 Phase II) Data Recovery, Irvine, CA. Client: The Irvine Community Development Company (ICDC). November 2005 to December 2006. Senior Crew Chief responsible for a 13-month-long Phase III investigation. Field responsibilities included, but were not limited to: keeping detailed data logs, photography, site documentation, equipment, directing a 20 person crew which included 2 assistant crew chiefs, scheduling, macrobotanical sampling and floatation, pollen sampling, wet screen station, artifact collections, transporting archaeological materials, maintenance of field supplies, purchasing, and general coordination. Sites investigated were: CA-Ora-244, 650, 762, 1297, 1311, 1588, and 1590 with a combined total of four hundred and forty three 2- by 2-meter units.

The Irvine Company, Portola Springs, Center Village and Lomas Valley Phase II Irvine, CA. Client: The Irvine Community Development Company (ICDC). January 2005 to September 2005. Crew Chief responsible for Phase II and III investigations, field supervisions, productivity logs, photography, site documentation, equipment, macrobotanical sampling and floating, wet screen station, artifact collections, pollen sampling, transporting archaeological materials, maintenance of field supplies, purchasing, and general coordination. Duties extended to the laboratory post excavation where responsibilities included supervising and training technicians, analysis, quality assessment, cataloging, DPR forms, scheduling maintenance of equipment, and archiving all archaeological data. All sites were tested to assess their significance per CEQA (California Environmental Quality Act) Guidelines and CRHR (California Register of Historical Resources). Sites investigated were PA6-01, 02, 03, 05, 06, 07, 08, 09, and 10.

Marblehead Coastal Development, in San Clemente, CA. Client: SunCal Company. January 2005 to April 2005. Paleontological and cultural monitor during rough grading activities, mapping, photography, GPS, scheduled and supervised other cultural and paleontological monitors

Pelican Hill in Newport Beach, CA. Client: The Irvine Company. September 2005 to November 2005. Field supervisor for rough grade activities. Duties included coordination with contractors, scheduling of paleontological and cultural monitors, and site inspections and assessment of discoveries.

The Irvine Company, Portola Springs, Center Village and Lomas Valley Phase I- Irvine, CA. Client: The Irvine Community Development Company (ICDC). June 2004 to September 2005. Crew chief responsible for providing cultural resource monitoring and evaluation services for a large scale development involving many previously recorded archaeological sites. All sites were tested to assess their significance per CEQA (California Environmental Quality Act) Guidelines and CRHR (California Register of Historical Resources). During Phase II and III investigations, field responsibilities included technician training and supervision, running field excavations and wet screen stations, macrobotanical sampling and floating, as well as lab analysis and management. Ground stone and lithic artifacts were analyzed for use and prepared for residue analysis

County Sanitation Districts of Los Angeles County, Lancaster Water Reclamation Plant Expansion Project. Client: Los Angeles County Sanitation Districts Nos. 14 and 20. August 2005. Crew chief for Phase I and II investigations, responsible for all pre-field preparations and equipment maintenance. Phase II was conducted on three sites discovered during the Phase I pedestrian survey. Temporary sites name are LWR-01, 02, and 03. Excavation responsibilities included site documentation and mapping, surface collection, photography, transporting of data, materials and crew, supervision of field technicians, and collecting specimens for sampling. Laboratory responsibilities included technician supervision, residue analysis preparations, lithic and ground stone analysis, and macrobotanical sampling and floatation.

El Dorado County Department of Transportation, California Tahoe Conservancy, Lake Tahoe Blvd Lane Reduction & Bike Trial Project, South Lake Tahoe, CA. Client: El Dorado County Department of Transportation. July 2005. Researcher responsible for archaeological documentation and organization. Researched historic and prehistoric archaeological sites including prehistoric camps and bedrock mortar sites, and conducted record searches for the cultural inventory in the project area. A write up of the literature search was produced and submitted in the final report.

Planning area 18 in Irvine, California. Client: The Irvine Community Development Company. September 2005. Crew chief responsible for conducting ten sixty meter trench excavations for Phase II testing. Conducted ground stone and lithic analysis of materials recovered during trenching as well as from previous pedestrian surveys.

Watkins House Historical Evaluation, University of California, Riverside. Client: UC, Riverside. July 2005. Research assistant to the historical archaeologist and was responsible for recording existing room dimensions, including storage rooms, vestibules, offices, chapel, halls, and furnishings. Also recorded were the modern modifications, room elements, and original components of the Watkins house. Responsibilities included photo documentation, and historical research. Contributions were included in the final report.

Shady Canyon Development Project, Irvine, CA. Client: The Irvine Community Development Company. September 2004 to December 2004. Lab technician responsible for floating macrobotanical samples, data entry, archiving and accessioning archaeological collection from sites CA-ORA-383, 730, 732, 733, 806, 1420b, 1422, 1423, 1576, 1582, 1584, 1585, 1586, and 1587

CA-ORA-1589, Irvine, California. Client: The Irvine Community Development Company (ICDC). July 2004 to August 2004. Crew member in a Phase III data recovery of a prehistoric site consisting of thirteen two by two meter units, excavated each in quad units. Responsibilities included producing detailed level forms, soil samples, wall profiling, floating macrobotanical samples, running the wet screen station, data entry, artifact analysis in lab as well as preparing documents and other materials from the project into archival formats.

Espana, CA-RIV-7458, Indio, CA. Client: Regency Homes. August 2004. Crew member of a Phase II investigation of a prehistoric Cahuilla site. Site was surveyed and surface materials were documented prior to beginning excavation. Responsible for training field technicians in excavation, documentation, extracting soil samples, and producing wall profiles, as well as excavating three one by three meter units.

C-113

7

Professional Organizations/Affiliations

Society for American Archaeology Society for California Archaeology

Professional Development

CEQA Workshop November 2007 Section 106 Essentials Workshop September 2011

Languages

English and Spanish

Presentations

California State University, Fullerton 23th Annual Anthropology Symposium 2003: A Chronological Synthesis of Southern California

SAA 2007 Conference: Site Structure and Function of Hunter Gatherer Communities of the Tomato Springs Region: A Look at Ground Stone Artifacts

Employment History

Archaeologist May 2008 to June 2008

Applied Biology

Duties: Archaeologist responsible for conducting 7 intense pedestrian surveys in Riverside County, California for transmission lines and telecommunications projects.

Archaeologist January 2008 to April 2008

Ecology and Environment, Inc.

Duties: archaeologists filling various capacities in Phase I investigations as well as conducting record searches, writing fatal flaw reports, and technical reports in accordance with National Historic Preservation Act, Section 106 guidelines.

Archaeologist November 2007 to January 2008

LSA Associates, Inc.

Duties: Field supervisor for projects in compliance with CEQA, 36 Code of Federal Regulations and Section 106 guidelines. Responsibilities included but were not limited to, supervision and directing of crew, artifact collection, creating and managing documentation, GPS, artifact analysis, scheduling, and report writing.

Archaeologist, July 2004 to November 2007 Stantec Consulting, Inc. Irvine, California *Project Archaeologist, December 2006 to November 2007

Director of archaeological investigations that included, but were not limited to, survey, construction monitoring, testing of two prehistoric sites and data recovery of 9 Historic Properties under the jurisdiction of the Unites States Army Corps of Engineers. Responsibilities included conducting cultural inventory searches, producing research designs, artifact analysis, GIS, coordination with Native American consultants and development contractors, scheduling staff, managing documentation (digital and hardcopy), producing 23 DPR site records updates, and report writing in accordance with CEQA and ARMR guidelines.

*Senior Crew Chief, June 2005 to December 2006

Stantec Consulting, Inc. Irvine, California (Formerly The Keith Companies)

Field Supervisor for monitoring, survey, test excavations, and data recovery of Historic Properties under the jurisdiction of the Unites States Army Corps of Engineers. Ms. Cardenas was also responsible for the supervision of lab technicians, artifact analysis, coordinating with development contractors and staff, archiving documentation, GPS, photo documentation, DPR forms, site updates, research, and assisting in report writing.

*Junior Crew Chief and Research Assistant, July 2004 to June 2005

The Keith Companies Irvine, California

Responsibilities included supervising field crews for Phase II test excavations and data recovery, assisting in report writing, digitizing documentation, data entry, cataloging, photography, artifact analysis, curation, paleontological monitoring and coordination, mapping, site forms and record updates.

Selected Reports

- 2011 Cultural Resources Inventory Report for the Santa Susana Field Laboratory, Areas I and II, Ventura County, California. Prepared for the National Aeronautics and Space Administration, George C. Marshall Space Flight Center, Alabama.
- 2011 City of Moreno Valley San Timoteo Foothill Neighborhood Flood Protection HMGP-DR-1810-CA: Finding of No Historic Properties Affected. Prepared for the City of Moreno Valley, California and Federal Emergency Management Agency.
- 2011 Cultural Resources Inventory Report for the Black Rock 5 & 6 Geothermal Project, Imperial County, California. Prepared for CalEnergy, LLC and the California Energy Commission, Sacramento, California.
- Application for Certification of the Black Rock 5 & 6 Geothermal Project: Section 5.3 Cultural Resources. Submitted to the California Energy Commission, Sacramento, California.
- 2011 Cultural Resources Monitoring Report for Taxilane S and Bradley West, Los Angeles World Airports, Los Angeles County, California.
- 2011 Draft Cultural Resources Inventory Report for the Painted Hills IV Wind Energy Project, Riverside County, California. Prepared for First Wind Energy, LLC, by CH2M HILL, Santa Ana, California.
- 2011 DRAFT Cultural Resources Monitoring and Mitigation Plan, Rice Solar Energy Project. Prepared by Gloriella Cardenas and Aaron Fergusson for the U.S. Bureau of Land Management and the California Energy Commission on behalf of Solar Reserve, LLC.

- 2011 Cultural Testing Report for the Alta Infill II Wind Energy Project, Kern County, California: For Archaeological Temporary Site No. S-11. Submitted to the Kern County Planning Department, Kern County, California.
- 2011 Cultural Resources Inventory Report for the Alta Infill II Wind Energy Project, Kern County, California. Prepared for Alta Windpower Development by CH2M HILL, Santa Ana, California.
- 2011 Cultural Resources Monitoring and Mitigation Plan: Oakley Generating Station Project. CH2M HILL, Santa Ana California. Prepared for Contra Costa Generating Station, LLC and California Energy Commission.
- 2011 Cultural Resources Monitoring and Mitigation Plan: Mariposa Energy Project. CH2M HILL, Santa Ana California. Prepared for Mariposa Energy, LLC and California Energy Commission.
- 2011 Cultural Resources Literature Search for the All American Canal Service Bridge, Calexico, California. CH2M HILL, Santa Ana, California. Prepared for the Imperial Irrigation District and Federal Emergency Management Agency.
- 2010 Cultural Resources Monitoring and Mitigation Plan: Ivanpah Solar Electric Generating System.

 CH2M HILL, Santa Ana, California. Prepared for Solar Partners I, LLC; Solar Partners II, LLC; and Solar Partners VIII, LLC, U.S. Bureau of Land Management, and California Energy Commission.
- 2010 Cultural Resources for the SNG Suwannee Pipeline Project, Alabama, Georgia and Florida. CH2M HILL, Santa Ana, California. Prepared for Southern Natural Gas Company.
- 2010 Cultural Resources Monitoring and Mitigation Plan: Almond 2 Power Plant Project. CH2M HILL, Santa Ana California. Prepared for Turlock Irrigation District and California Energy Commission.
- 2010 Devers-Palo Verde No. 2 Transmission Line Project: Construction Transportation Plan Devers Yard. Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.
- 2010 Memorandum: Tehachapi Renewable Transmission Project Preconstruction Photographic Documentation Mesa Material Storage Yard. Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.
- Cultural Memo for the Schuyler Heim Bridge Replacement and SR 47 Expressway Project Documentation of Project Description Changes to Land Use, Recreation, and Coastal Zone.
 Prepared for Caltrans District 7. Prepared by CH2M HILL, Santa Ana, California.
- 2010 Devers-Palo Verde No. 2 Transmission Line Project: Construction Specifications. Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.
- 2010 Memorandum: Tehachapi Renewable Transmission Project Preconstruction Photographic Documentation Segment 8 Telecom. Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.
- 2010 Phase II Cultural Resources Evaluation of EAFB-3897 (CA-LAN-2692, 19-002692), Air Force Plant 42, Los Angeles County, California. Submitted to the Base Historic Preservation Office, Edwards AFB.

- 2010 *Hidden Hills Project Fatal Flaw Analysis (Cultural)*. Prepared for Bright Source Energy, Oakland, California. Prepared by CH2M HILL, Santa Ana, California.
- 2009 Cultural Resources Inventory Report for the 9.02 Acre Turner Parcel (Assessors Parcel Number 686-040-021), Section 2, Township 5 South, Range 4 East, Agua Caliente Indian Reservation, City of Palm Springs, Riverside County, California. Submitted to the Agua Caliente Band Of Cahuilla Indians, Tribal Historic Preservation Office, Palm Springs, California.
- 2009 Cultural Resources Inventory Report for the 52.27 Acre Andreas Cove Parcels (Assessors Parcel Numbers 686-040-024, 686-040-025, 686-040-026, and 686-040-027), Section 2, Township 5 South, Range 4 East, Agua Caliente Indian Reservation, City of Palm Springs, Riverside County, California. Submitted to the Agua Caliente Band Of Cahuilla Indians, Tribal Historic Preservation Office, Palm Springs, California.
- 2009 Cultural Resources Inventory Report for the 8.45 Acre Turner Parcel (Assessors Parcel Number 686-040-006), Section 2, Township 5 South, Range 4 East, Agua Caliente Indian Reservation, City of Palm Springs, Riverside County, California. Submitted to the Agua Caliente Band Of Cahuilla Indians, Tribal Historic Preservation Office, Palm Springs, California.



Clint Helton, RPA

Senior Cultural Resources Specialist

Education

M.A., Anthropology, Brigham Young University B.A., Language and Literature, University of Utah

Professional Registration

Registered Professional Archaeologist (1999, No. 11280)

Distinguishing Qualifications

- 14 years of experience conducting environmental impact evaluations, with particular expertise in conducting cultural resources studies in California, Arizona, Nevada, and Utah
- Extensive experience in regulatory compliance, cultural resources, National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance activities
- Highly experienced managing cultural resources studies for large linear utility, energy, and transportation projects

Relevant Experience

Mr. Helton has more than 14 years of environmental management experience in the United States. He has a strong background in environmental impact evaluations, having directed technical studies; negotiated with lead agencies, responsible agencies and clients; and has written, edited, and produced a substantial number of environmental review and technical documents. Mr. Helton frequently acts as a senior technical advisor and senior reviewer for projects and clients throughout the United States, with particular expertise in Arizona, California, Nevada, and Utah.

His knowledge of regulatory compliance and cultural and paleontological resources enables him to manage National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance activities and document preparation. Mr. Helton is a particularly skilled practitioner of federal regulations governing treatment of cultural resources, especially Section 106 of NHPA (36CFR800) and the Native American Graves Protection and Repatriation Act (NAGPRA) (43CFR10). Mr. Helton has significant expertise conducting consultation with State and Federal agencies, as well as facilitating formal government-to-government consultation with Native American groups and tribes throughout the western U.S. Mr. Helton has authored numerous environmental technical reports, cultural resources management plans, cultural resources studies, Programmatic Agreements, Memorandums of Understanding (MOU), and contributed to many NEPA documents for a variety of private and public sector clients.

Mr. Helton is experienced with the challenges of preparing environmental documentation for large linear utility and transportation projects and is familiar with the process and guidelines of the California Energy Commission (CEC) and Federal Energy Regulatory Commission (FERC), Western Area Power Administration (WAPA), Bureau of Land Management (BLM), US Forest Service, Bureau of Indian Affairs (BIA) among others.

1

Clint Helton, RPA

Additionally, Mr. Helton has conducted environmental impact assessment in Mexico. Mr. Helton is native-level bilingual in Spanish and has extensive knowledge of many Spanish-speaking countries.

Representative Projects

Task Lead, Tonto National Forest Control Road Bridge Replacement Project, Gila County, Arizona. Conducting cultural resources study in compliance with Section 106 of the National Historic Preservation Act. Coordination with Central Federal Lands, US Forest Service, Arizona SHPO, and consultation with Gila County, Arizona. Preparation of technical report.

Task Manager, US Border Patrol; Customs and Border Protection, Facilities Expansion, Multiple Locations Along United States Southern Border. Lead preparation of numerous cultural resources studies in support of NEPA Environmental Assessments and Phase I Environmental Site Assessments in support of US Border Patrol facility expansion projects along the US/Mexico border. Included investigations for facilities in New Mexico, Texas, Arizona, and California. Received "Exceptional" performance rating.

Task Manager/Principal Investigator, SolarReserve, Rice Solar Energy Project, San Bernardino County, California. Assisted with preparation of AFC for CEC in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by the Bureau of Land Management in San Bernardino County, California. Lead Federal agency is WAPA and also included BLM coordination. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Project Principal; Parker to Blythe Transmission Line Project; Western Area Power Administration; Imperial County, California. Provided overall management of cultural resources services for the Parker-Blythe #1 161-kilovolt (kV) transmission line project. The inventory extended from Blythe, California, to Parker, Arizona. A total of 147 sites (136 in California and 11 in Arizona) were recorded.

Task Manager, BrightSource Energy, Ivanpah Solar Electric Generating System Project, San Bernardino County, California. Assisted with preparation of AFC for CEC in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by the Bureau of Land Management in San Bernardino County, California. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Task Manager, National Science Foundation National Ecological Observation Network (NEON); Multiple Locations in Continental United States (AL, AZ, CA, CO, KS, MA, MD, MI, MN, NH, NM, FL, GA, OK, TX, WA, WI, VA) and Hawaii, Alaska, and Puerto Rico. Task Lead and overall management of a large national cultural resources study in support of NEPA Environmental Assessment. The study is analyzing environmental impacts of a large and comprehensive network of scientific infrastructure located in a variety of ecological zones designed to monitor environmental conditions and to provide data on climate change. Work included archival research, field visits, and coordination with applicable state archives and preparation of correspondence to multiple SHPO's.

Task Manager, Terra-Gen LLC Alta Wind Project, Kern County, California. Task Lead, quality control manager, and overall management of cultural resources studies for this 5,000-acre-plus alternative

Clint Helton, RPA

energy development project near the City of Tehachapi, Kern County, California. Provide regulatory guidance, regional technical expertise in cultural resources and coordination with Kern County. Supervised inventory for cultural resources, technical report preparation, and conducted Native American Consultation.

Task Manager, Iberdrola Renewables, Multiple Solar Energy Development Projects, Arizona, California, New Mexico, and Nevada. Led preparation of cultural resources assessments for solar power generation facilities in Arizona, New Mexico, Nevada, and California. Mr. Helton is acting as principal investigator for several critical issues analyses as well as full permit preparation of solar energy development projects in Arizona, California, Nevada, and New Mexico. Project acreages range from 5,800 acres to 35,000 acres.

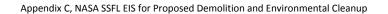
Task Manager, PPM Energy, Solar Energy Development, Arizona, Nevada, California. Cultural resources assessments for solar power generation facilities in Arizona, Nevada, and California. Mr. Helton is acting as principal investigator for literature searches and field visits for several proposed solar energy projects in Arizona, California, and Nevada. Project acreages range from 2,000 acres to 25,000 acres.

Professional Organizations/Affiliations

Association of Environmental Professionals Register of Professional Archaeologists Society for American Archaeology American Anthropological Association

Training and Certifications

CEQA Training
NEPA Training
Section 106/NHPA Training
Federal Antiquities Permit in Arizona, California, Oregon, Washington, Utah, and Nevada



Curriculum Vitae

Michelle Kaye

Home Address: 1300 Southampton Rd., #104 Benicia, CA. 94510

(707) 746-7871 (h) (707) 315-6013 (c)

Email: mkaye_1@yahoo.com

Citizenship: U.S. Citizen and Canadian Citizen (dual nationality)

✓ Qualifications: Physical Anthropologist/Archaeologist with a strong background in cultural resource management, including producing reports to comply with NEPA, NHPA, CEQA, and NAGPRA. Over 10 years of experience conducting archaeological field and laboratory research, including experience with federal and defense contracts. Specialized training in human and faunal osteological analysis, forensic anthropology, forensic archaeology, DNA analysis, and journalism. Over 11 years of experience as a journalist. Recipient of a Lucas Foundation Research Grant, Forensics Science Foundation (2003) and the Geist Fund Grant (2007) among others.

Education:

2008: Ph.D., Biological Anthropology. University of Alaska Fairbanks, P.O.B.

757500, Fairbanks, AK. 99775. Advisor: Dr. Joel Irish.

2003: M.A., Biological Anthropology. San Francisco State University, 1600

Holloway Avenue, San Francisco, CA. 94132. Advisors: Drs. Steve Gabow and

Mark Griffin.

1993: B.A., Anthropology, emphasis in Archaeology. San Francisco State University,

1600 Holloway Avenue, San Francisco, CA. 94132. Advisor: Dr. Steve Gabow

1993: B.A., Journalism, San Francisco State University, 1600 Holloway Avenue, San

Francisco, CA. 94132. Advisor: Dr. John Burks.

Additional Education:

Winter 2011: American Academy of Forensic Sciences, 63rd Annual Meeting, Chicago IL.

Completed workshops in Geometric Morphometrics and Digitizing, and in

Fordisc 3.1.

Winter 2010: American Academy of Forensic Sciences, 62nd Annual Meeting, Seattle, WA.

Completed workshop in The Forensic Investigation of Human Remains from

Armed Conflicts and Catastrophes.

Winter 2009: American Academy of Forensic Sciences, 61st Annual Meeting, Denver, CO.

Completed workshop in Advances in Archaeological Approaches to Crime

Scene Investigation.

Winter 2008: American Academy of Forensic Sciences, 60th Annual Meeting, Washington,

D.C. Completed workshop in Measurements, Statistics, Terminology, and

Quantitative Methods: Uses and Interpretations in Physical/Forensic

Anthropology.

American Academy of Forensic Sciences, 59th Annual Meeting, San Antonio, Winter 2007: TX. Completed a workshop in Restorative Dentistry as Evidence, and a workshop in Missing Persons. American Academy of Forensic Sciences, 58th Annual Meeting, Seattle, WA. Winter 2006: Completed a workshop in Advanced Topics in STR DNA Analysis, and a workshop in Recovery, Examination, and Evidence of Decomposed and Skeletonized Bodies: an Anthropological and Entomological Approach. American Academy of Forensic Sciences, 57th Annual Meeting, New Orleans, Winter 2005: LA. Competed workshop in Quality Assurance in Forensic Anthropology. American Academy of Forensic Sciences, 56th Annual Meeting, Dallas, TX. Winter 2004: Completed workshop in Forensic Human Mitochondrial DNA Analysis. International Association for Identification, 88th International Education Summer 2003: Conference, Ottawa, Canada. Certificate received in Forensic Entomology and the Crime Scene, Development of Latent Prints with Titanium Dioxide, and certificate received in DNA Unraveled: A Practical Guide to Crime Scene Investigators. American Academy of Forensic Sciences, 55th Annual Meeting, Chicago, IL. Winter 2003: Certificates received in Extracting DNA from Challenging Sample Materials and in Low Copy Number DNA Analysis. Fall 2002: County of Los Angeles Department of the Coroner, Los Angeles County Coroner Seminar, Los Angeles, CA. Certificate Received in Handling Death in a Diverse Society. International Association for Identification, 87th International Educational Summer 2002: Conference, Las Vegas, NV. Certificates received in Forensic Archaeology, Scattered Human Remains and Forensic Archaeology, Buried Human Remains. Summer 2002: Disaster Mortuary Operational Response Teams Regional Training Session, Region 9. Laughlin, Nevada. Attended discussions on the use of Disaster Portable Mortuary Units, site recovery, identification of unattached body parts, and the computerized Victim Identification Program. Summer 2000: University of New Orleans, New Orleans, LA. and Southern Institute of Forensic Science. Certificate received in Basic Forensic Pathology for Law Enforcement, Death Investigators, and Health Care Professionals. Summer 1999: University of New Orleans, New Orleans, LA. and Southern Institute of Forensic Science. Certificate received in Advances in Forensic Anthropology. Summer 1998: University of New Orleans, New Orleans, LA. and Southern Institute of Forensic Science. Certificate received in Basic Forensic Anthropology. University of California at Berkeley, Berkeley, CA. Completed course in Summer 1997: Archaeological Field Methods. PI: Dr. Laurie Wilke, U.C. Berkeley Department of Anthropology. Excavation conducted on an 1860's homestead and commercial development located within Annadel State Park in Sonoma County, CA.

Anthropology/Academic Employment:

April 2011 – June 19, 2011: Analytical Envi

Analytical Environmental Services. Senior Archaeologist. 1801 7th Street Suite 101, Sacramento, CA. 95811. Supervisor: Miss Ryan Lee. Phone: (916) 447-3479. (Duties: Archaeological field and laboratory work, cultural resource management compliance, including writing reports to comply with CEQA, NEPA, NHPA, and NAGPRA.)

August 2010 – April 2011:

Chambers Group Inc. Senior Cultural Resources Specialist/Lead Archaeologist, U.S. Army National Training Center, Fort Irwin. NTC-DPW-Environmental-Cultural Resources. IMWE-IRW-PWE P.O. Box 105085 – Fort Irwin, CA. 92310-5085. Supervisor: Dr. Bob Yelin Phone: 818-388-1705. Email: byelin@chambersgroupinc.com. (Duties: Supervise a staff of six archaeologists. Direct experience with all aspects of archaeology, including compliance with archaeological legislation including NEPA documentation, sections 106 and 110 of NHPA, archaeological surveys, site recordation, test excavation, and site evaluation for eligibility to the National Register of Historic Places. Human and faunal osteological analysis. Contact point for multiple agencies and contractors.)

July 2010 – August 2010:

U.S. Department of the Interior. U.S. National Park Service. Aztec Ruins National Monument. Archaeologist. Address: 84 County Road 2900 "Ruins Road" Aztec, New Mexico 87410. Supervisor: Mr. Gary Brown. Phone: 505-334-6174. Email: Gary_Brown@nps.gov. (Duties: Archaeological excavation, identification, and inventory of archaeological resources, cultural resource management, ruins stabilization, and scientific research and interpretation of archaeological resources.)

March 2008 – September 2010:

University of California Medical Center San Francisco. Department of Orthopaedic Surgery. UCSF/SFGH Orthopaedic Trauma Surgical Training Facility. Research Assistant IV. Address: San Francisco General Hospital, Department of Orthopaedic Surgery, University of San Francisco, 1001 Potrero Ave., Room 3A36, San Francisco, CA 94110. Supervisor: Mr. John Houston III, Division Manager. Phone: 415-206-8812. Email houstonj@orthosurg.ucsf.edu. (Duties: Dissection and prosection of cadavers, suturing cadavers, biomechanical research, assisting surgeons and engineers in the testing and validation of hardware on human cadavers to repair bone fractures, familiarization with orthopaedic surgical instrumentation, operation of robots for the testing of hardware, reading radiographs, operation of Philips X-ray/Fluoroscope, Philips C-Arm, Philips 3-D C-Arm, and Orthoscan Mini C-Arm.)

February 2010:

Paleo Solutions. Archaeologist. Address: 2035 Palcentia Avenue, Suite D, Costa Mesa, CA. 92627. Supervisor: Scott Armstrong, Vice President. 526-818-7713. (Duties: Contract position. Conducted an archaeological survey along Segment 8 of the Tehachapi Renewable Transmission Project in Los Angeles and San Bernardino Counties for Southern California Edison under subcontract to Pacific Legacy. Documented historical artifacts. Project area approx. 35 miles.)

March 17, 2009-Oct. 31, 2009:

Cogstone Resource Management, Inc. Cultural Resource Management. Field Supervisor Tehachapi Renewable Transmission Project, Los Angeles and Kern County, California. Address: 1518 West Taft Avenue, Orange, CA. 92685. Field Director: David Morrill Phone: (714)-743-9206. (Duties: Supervised a team of cross-trained archaeology and paleontology field monitors in several locations in and around the Mojave Desert and Angeles National Forest, conducted asneeded archaeological surveys and field monitoring for Southern California Edison under subcontract to Pacific Legacy. Duties included reporting on site conditions, soil/geologic analysis, human and faunal osteological analysis, site recordation, site mitigation, data recovery, and documentation for environmental and archaeological impact studies. Knowledge of legislation affecting archaeological projects, incl. NEPA, CEQA, and NHPA, esp. sections 106 and 110. Served as a contact point for multiple agencies and contractors. Total project area encompassed more than 75 linear miles. Additional projects: Pixar Construction site, Emeryville, CA.)

May 2006 – Aug. 2006:

Holman and Associates, Archaeological Consultants. Archaeologist. Address: 3615 Folsom Street, San Francisco, CA. 94110. Phone: 415-550-7286. Supervisor: Mr. Randy Wiberg, Principal Investigator. Phone: 650-588-3104. Email: Rwiberg@comcast.net. (Duties: Part of a team that excavated approx. 400 human burials from a Paleo-Indian site. Survey, test pits, excavation of human remains, faunal and osteological analysis, map reading, creation of profile maps, compass reading, collection of samples for floatation, screening, accurate detailed recording of field notes, field interpretation strategies, and knowledge of legislation pertaining to archaeology (NEPA, CEQA, NHPA, and NAGPRA.)

Aug. 2005 - Dec. 2005:

University of Alaska Fairbanks, Department of Anthropology. Graduate Teaching Assistant, Human Osteology. Address: University of Alaska Fairbanks, 310 Eielson Building, P.O.B. 757720, Fairbanks, AK. 99775-7720. Supervisor: Dr. Joel D. Irish, Professor of Biological Anthropology. Phone: 907-474-6755. Email: ffjdi@uaf.edu. (Duties: Assisting with laboratory instruction in human and faunal osteology, giving occasional lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, supervising classroom, and processing faunal remains.)

Sept. 2004 - May 2005:

Center for Alaska Native Health Research. Graduate Research Assistant. Address: Institute of Arctic Biology, Irving 1, rm. 311, Box 757000, University of Alaska Fairbanks, Fairbanks, AK. 99775-7000. Supervisor: Dr. Cécile Lardon, Project PI. Phone: 907-474-5272. Email: cecile@canhr.uaf.edu. Salary \$16.00/hr. Hours: 20/wk. (Duties: Statistical analysis of biological and social support data using SPSS. Helped initiate a community-based support and educational system to address diabetes and obesity in seven Yu'pik villages. Academic journal and internet research, generating memos, reports, PowerPoint presentations, and supervising one employee.)

Jan. 2003 - May 2004:

University of Alaska Fairbanks, Department of Anthropology. Graduate Teaching Assistant, Cultural Anthropology. Address: University of Alaska Fairbanks, 310 Eielson Building, P.O.B. 757720, Fairbanks, AK. 99775-7720. Email: fyanth@uaf.edu. Supervisor: Dr. Patty A. Gray, Affiliate Associate Professor of Cultural Anthropology. Phone: +353-1-708-6084. Email: patty.gray@nuim.ie. (Duties: Instructor for three discussion sections of Cultural Anthropology 100X approx. 35 students each, Teaching Assistant to large seminar on the same topic, giving lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, and supervising classroom.)

Aug. 2000 – Dec. 2000:

San Francisco State University, Department of Anthropology. Graduate Research Assistant, Biological Anthropology. Address: San Francisco State University, Department of Anthropology, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisor: Dr. Steve Gabow, Professor of Anthropology Emeritus. Phone: 415-338-2046. Email: antho@sfsu.edu. (Duties: Assisting professor with instruction in biological anthropology, giving occasional lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, and supervising large classroom, approx. 200 students.)

Sept. 1998 – May 2000:

San Francisco State University, Department of Anthropology NAGPRA Compliance Project. Graduate Research Assistant. Address: San Francisco State University, Department of Anthropology, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisor: Dr. Jeffrey B. Fentress, NAGPRA Director. Phone: 415-338-3075. Email: fentress@sfsu.edu. (Duties: Identification and analysis of human remains for NAGPRA compliance. Creation of biological profile. Determination of age, sex, ancestry, stature, and trauma of individuals from human skeletal remains. Cataloguing remains. Writing official NAGPRA reports on results of osteological analysis. Identification of common bone pathologies. Transcription of interviews with Native Americans. Expert on NAGPRA regulations.)

Jan. 2000 - May 2000:

San Francisco State University, Department of Anthropology. Graduate Research Assistant, Biological Anthropology. Address: San Francisco State University, Department of Anthropology, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisor: Dr. Steve Gabow, Professor of Anthropology Emeritus. Phone: 415-338-2046. Email: antho@sfsu.edu._(Duties: Assisting professor with instruction in biological anthropology, giving occasional lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, and supervising large classroom, approx. 200 students.)

Sept. 1998- May 2000:

San Francisco State University, Department of Biology. Research Assistant, Anatomy Laboratory. Address: San Francisco State University, Department of Biology, Hensill Hall 534, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisors: Mr. Jett Chin, Laboratory Instructor, Biology. Phone: 415-338-1549. Mr. Lawrence Okumoto. Phone: 408-390-0760. Email: hinagata@hotmail.com. (Duties: Instruction in osteology. Assisting anatomy students with dissection of human cadavers and processing human remains. Macerating human and faunal remains, processing remains by heating to remove all tissue. Identification, organization, and rejoining of isolated bone components. Maintenance of a (dermestid) beetle colony.)

May 1998 – Aug. 1998:

University of California at Berkeley, Department of Anthropology. Research Assistant to Graduate Student in the Department of Anthropology. Archaeologist/Laboratory Assistant. Address: University of California at Berkeley, Department of Anthropology, 232 Kroeber Hall, Berkeley, CA. 94720-3710. Phone: 510-642-3392. Fax: 510-643-8557. (Duties: Supervised undergraduate students in the field. Excavation and test pits conducted at an 1860's homestead, a small historic cabin and at stone quarries, dating from 1887 to 1913, located within Annadel State Park in Sonoma County, CA., Test pits, excavation, faunal and human osteological analysis, map reading, creation of profile maps, compass reading, screening, accurate detailed recording of field notes, field interpretation strategies, and knowledge of legislation pertaining to archaeology.)

May 1997 – Aug 1997:

University of California at Berkeley, Department of Anthropology. Archaeologist/Laboratory Assistant (Field School). Address: University of California at Berkeley, Department of Anthropology, 232 Kroeber Hall, Berkeley, CA. 94720-3710. Supervisor: Dr. Laurie Wilkie. Professor of Archaeology. Phone: 510-643-0677. Email: lawilkie@berkeley.edu. (Duties: Excavation and test pits conducted at an 1860's homestead, a small historic cabin and at stone quarries, dating from 1887 to 1913, located within Annadel State Park in Sonoma County, CA. Site survey, use of transit, test pits, excavation, faunal osteology, map reading, creation of profile maps, compass reading, screening, accurate detailed recording of field notes, cleaning and curation of artifacts, field interpretation strategies, and knowledge of legislation pertaining to archaeology.)

Journalism Employment:

Aug. 1994 – May 2000: Contra Costa Times Newspapers/Knight Ridder.

Journalist. Address: 1 Harold Court, Walnut Creek, CA. 94597. Editor:

Mr. David Weinstein. Phone: 925-933-1717. Email:

davidsweinstein@yahoo.com. Hours: varied. (Duties: <u>Generating and</u> writing stories on people and places primarily in the San Francisco Bay Area. Writing published in several sections, including Business, <u>Community News, Health/Science, Travel/Outdoors, Features and Special Sections. Stories published in Contra Costa Times, West County Times, Valley Times, Ledger Dispatch, and San Ramon Valley Times. (Dailies). Stories also published in the Contra Costa Times</u>

magazine: Discover the Delta.)

July 1998 - Oct. 1998: USA Hosts Destination Services. Contract Writer. Address: 657

Mission Street, Suite 202, San Francisco CA. 94105. Phone: 415-695-8000. Email: sales@usahosts.com. Hours: varied. (Duties: Responsible for updating and revising USA HOSTS Tours and Activities Tariff, delivering accurate information on tours, museums, sights, restaurants, hotels, convention facilities, and banquet options for corporate clients

visiting the Bay Area.)

Oct. 1997 - April 1998: Fodor's Travel Publications. Travel Writer. 1745 Broadway, 15th floor,

New York, NY 10019. Hours: 40/wk. (<u>Duties: Responsible for writing introduction to California and for updating and revising material covering the Sierra Nevada and Eastern Sierra, delivering accurate information on tourist resources, transportation, museums and sights, restaurants, hotels, and outdoor activities. Material published in Fodor's</u>

California 1999, as well as in the San Francisco city guide.)

May 1996 – Aug. 1996: Fodor's Travel Publications. Travel Writer. 1745 Broadway, 15th

Floor, New York, NY 10019. Hours: 40/wk. (<u>Duties: Responsible for updating and revising material covering the Sierra Nevada and the San Joaquin Valley, L.A. Environs and Coast, Palm Springs, and the California Desert, delivering accurate information on tourist resources, transportation, museums and sights, restaurants, hotels, and outdoor activities. Material published in The Berkeley Guides to California, as</u>

well as the San Francisco and Los Angeles city guides.)

Aug. 1994 – June 1995: The Inter-City Express/Daily Journal Corporation. Reporter. Address:

1109 Oak Street, Ste. 103, Oakland, CA. 94607-4917. Phone: 510-272-4747. (Duties: Reporting on real estate, legislative issues related to construction, finance, crime/homicides in Oakland, Oakland city

government, and human interest.)

March 1993 – March 1995: The Nose Magazine, Writer/Intern. San Francisco, CA. Editor: Mr.

Jack Boulware. (<u>Duties: Writing for various magazine sections.</u> Editing under deadline pressure, research, fact-checking, typing,

phones, mailings, filing, and general office support.

July 1994 – Nov. 1994: Diabetes Interview. Staff Writer. San Francisco, CA. (<u>Duties: Medical</u>

writing on advances in the care and treatment of diabetes, academic

research, fact checking, and editing.)

Sept. 1993 – Oct. 1993: The Polk Street Express. Staff Writer. San Francisco, CA. (Duties:

<u>Reporting on the Polk Street area, and interviewing local residents,</u> generating stories for publication, editing, research and fact-checking.)

Sept. 1993 – Oct. 1993: The New Fillmore. Staff Writer. Address: 2130 Fillmore Street, #202,

San Francisco, CA. 94115 415-441-6070. Email:

editors@newfillmore.com. (<u>Duties: Reporting from a community</u> perspective, writing feature and news stories for publication, editing,

fact checking, and research.)

Sept. 1993: The Petaluma Argus-Courier. Freelance Writer. Address: P.O.B. 1091,

Petaluma, CA., 94953. Phone: 707-776-8453. Email:

csamson@arguscourier.com. (Duties: Reporting on bike helmet safety: laws and regulations after the death of two Petaluma youngsters in

biking accidents.)

Jan. 1991 – May 1992: Prism Magazine. Staff Writer. Address: San Francisco State University,

Department of Journalism, Humanities 305, 1600 Holloway Avenue, San Francisco, CA, 94132. Email: jour@sfsu.edu. Editor: Dr. John Burks, Professor of Journalism. Phone: 415-338-1689. Email: jburks@sfsu.edu. (Duties: Writing feature stories, a travel column, restaurant reviews, and reporting on San Francisco trends. Editing, fact-checking, research, conducting interviews, laying out the magazine,

and photography.)

Oct. 1989: Golden Gater Newspaper. Freelance Writer. Address: San Francisco

State University, Department of Journalism, Humanities 305, 1600 Holloway Avenue, San Francisco, CA, 94132. Email: jour@sfsu.edu. Editor: Dr. John Burks, Professor of Journalism. Phone: 415-338-1689. (Duties: Reporting on the aftermath of the Loma Prieta earthquake, generating stories for publication, fact-checking, editing, and research)

Grants and Awards Received:

Geist Fund Grant. Grant entitled: Molecular Identification and Analysis of Treponematosis in Ancient Mummified Remains from Northern Chile and Southern Peru. 2007 (\$1,000)

University of Alaska Fairbanks, Anthropology Department Fellowship, 2006 (\$6,050)

Graduate Chancellor Assistantship, 2006 (\$2,196)

University of Alaska Fairbanks, Travel Grant, 2005 (\$600)

Lucas Foundation Research Grant, Forensic Sciences Foundation 2003, (\$2,500). Grant entitled DNA Degradation in Progressively Burned Human Bone and Tissue: Recognition of Techniques for Optimal DNA Sequence Analysis. Grant awarded to (PI) Ms. Michelle Kaye, Ms. Elayne Pope, Dr. Frank Cipriano, and Dr. O.C. Smith.

Anthropology Department, San Francisco State University, Research Fund: 2000, (\$700) for Ancient DNA Research.

California State University Grant, 1997 (\$948), 1998 (\$1,584), 1999 (\$1,506), 2000 (\$438).

College of Behavioral and Social Sciences, Grant for Graduate Research, 1999 (\$500)

Journalism Department, San Francisco State University, Award for Article Writing, spring 1993.

California Intercollegiate Press Association, Gold Press Card, Best Magazine Human Interest (Prism), 1992.

America-Israeli Friendship League Young Journalist's Exchange Program in Israel, 1992

Contiki Tours International Travel Writing Contest, Spring 1991.

Medal Winner Santa Rosa Press Democrat Editorial Contest, Spring 1988.

Public Speaking Finalist, Sonoma County, Spring 1988.

Reports and Publications:

Molecular Identification and Analysis of Treponematosis (Syphilis, Bejel, Yaws, or Pinta) in Ancient Mummified Remains from Northern Chile and Southern Peru. Ph.D. Dissertation. University of Alaska Fairbanks, Department of Anthropology, Fairbanks, AK. 2008.

<u>Possible Treponematosis in the Nanjemoy Ossuaries, Maryland.</u> Master's Thesis, San Francisco State University, Department of Anthropology, San Francisco, CA. 2003.

Osteological Analysis of Human Remains from Alameda sites (4-Ala-12, 4-Ala-13). Dr. Jeff Fentress, Ms. Julie Lopez, and Ms. Michelle Kaye. A report prepared for the NAGPRA Inventory, Department of Anthropology, San Francisco State University, San Francisco, CA. 1999.

Osteological Analysis of Human Remains from Alameda sites (4-Ala-328, 4-ALA-329). Dr. Jeff Fentress, Ms. Julie Lopez, Ms. Michelle Kaye, and Mr. Nathan Holton. A report prepared for the NAGPRA Inventory, Department of Anthropology, San Francisco State University, San Francisco, CA. 1999.

Chemical Contamination of Repatriated Native Californian NAGPRA Materials. Wrote and designed materials for conference held at San Francisco State University, San Francisco, CA. Sept. 30-Oct. 1, 2000.

Numerous reports produced for the U.S. Army, National Training Center/Fort Irwin for cultural resource management compliance. Reports available upon request.

Archaeology Projects:

- *Annadel State Park, Sonoma, CA.
- *Shea Homes, Trilogy Subdivision, Brentwood, CA.
- *Tehachapi Renewable Transmission Project, multiple locations in
- Southern California.
- *Aztec Ruins National Monument, Aztec, NM
- *Fort Irwin National Training Center, Fort Irwin, CA.
- *Auburn Indian Rancheria Tribal Project, Auburn, CA.
- *Coyote Valley Indian Reservation, Redwood Valley, CA.
- *Pauma Indian Reservation, Pauma Valley, CA.
- *San Jose Water Company, San Jose, CA.
- *Half Moon Bay, Vicente Creek Water Diversion, Half Moon Bay, CA.
- *Wheeler Island, Solano County, CA.
- *Calaveras Telephone, Calaveras County, CA.
- *Lake Natoma Bike Trail, Folsom, CA.

Abstracts:

Mercury in Ancient Human Hair from a Chilean Mummy. Ms. Michelle Kaye, Dr. Joel Irish, Dr. Bernardo Arriaza, and Dr. Lawrence Duffy. Results of mercury analysis on a northern Chilean Chinchorro mummy. Results compared to mummies from the Karluck archaeological site in Kodiak, AK. and Barrow, AK. to provide comparative examples of dietary mercury exposure. Arctic Science Conference, Fairbanks, AK. October 2-4, 2006. (Supported in part by NSF-OCE 0525275)

Public Presentations:

Molecular Identification and Analysis of Treponematosis (Syphilis, Bejel, Yaws, or Pinta) in Ancient Mummified Remains from Northern Chile, presented at the annual meeting of the Mountain, Desert, Coastal Forensic Anthropologists, Lake Mead, NV. May 2007.

Molecular Identification and Analysis of Treponematosis (Syphilis, Bejel, Yaws, or Pinta) in Ancient Mummified Remains from Northern Chile and Southern Peru, presented at the University of Alaska Fairbanks, Fairbanks, AK. March 2007.

An Experimental Test of the Accuracy of Human Forensic Identification Techniques for Analysis of Burn-damaged Bone and Tissue, presented at the American Academy of Forensic Sciences annual meeting, New Orleans, LA. February 2005.

The Role of the Forensic Anthropologist, presented at City College of San Francisco, San Francisco, CA. February 2001.

Possible Treponematosis in the Nanjemoy Ossuaries, Maryland, presented at San Francisco State University, San Francisco, CA. Fall 2001.

Introduction to Archaeology, presented at Petaluma Valley Academy, Petaluma, CA. Fall 1999.

Additional Archaeological Experience:

Oct. 2006:

Archaeologist: University of Alaska Fairbanks. Supervisor: Dr. Joel Irish. Excavation of Alaskan Honor Chief Nagita from an unmarked grave in Fairbanks, AK. Work conducted for Alaska Natives from Nenana, AK.

Oct. 2005: Search Crew: University of Alaska Fairbanks. Supervisor: Dr. Joel Irish.

Assisted Alaska State Troopers in the search for a clandestine grave in

Fairbanks, AK.

Molecular/Anthropological Research/Contract Work:

2011: "Elemental Analysis, Mineralogical Analysis, and DNA Recovery from

Progressively Burned Human Bone and Tissue." A grant submitted to the National Institute of Justice in response to grants relating to "Research and Development on Instrumental Analysis for Forensic Science Applications." Drs. Greg Hampikian, Mike Davis, Matthew Kohn, Lisa Nelson, Michelle Kaye,

and Celina Suarez.

2011: "Signatures of Burn History: Elemental Analysis, Mineralogical Analysis, DNA

Profile Changes, and Electron Microscopy of Progressively Burned Human Bone and Tissue. A grant submitted to the National Institute of Justice, in response to solicitation for grants relating to "Basic Scientific Research to Support Forensic Science for Criminal Justice Purposes." Drs. Greg Hampikian, Matthew Kohn, Michelle Kaye, Elayne Pope, Paul Olin, Samantha Evans, and

Laura Wendell.

2008-2010: Variation in femur subtrochanteric shape in Alaska Natives. Research

undertaken at the American Museum of Natural History, Department of Physical Anthropology, New York, NY. Results compared to various ancestral groups.

Work conducted with Drs. Daniel Westcott and George W. Gill.

2006: Molecular analysis of three shrunken heads from Ecuador. Research conducted

to determine through mtDNA analysis whether the skin covering the crania is human. Laboratory research conducted at the Conservation Genetics Laboratory

at San Francisco State University, San Francisco, CA.

2006: Molecular analysis of ancient mummies from northern Chile. Research

conducted to recover mtDNA and to test for treponematosis, tuberculosis, and leprosy. Molecular analysis conducted at the Paleo-DNA Laboratory, Northern Ontario Technology Center, Thunder Bay, Ontario (Canada). Bioarchaeological research conducted investigating a possible relationship between treponematosis in the Chinchorro mummies and their mortuary rituals. Osteological analysis

conducted at the Museo San Miguel de Azapa in Arica, Chile.

2006: Recovery of mtDNA and nuclear DNA from an ancient Egyptian mummy.

Analysis conducted at the Paleo-DNA Laboratory, Northern Ontario

Technology Center, Thunder Bay, Ontario (Canada).

2006: Analysis of mtDNA from a 100-year-old skeleton from Nenana, AK. Analysis

undertaken for the family of Chief Nagita. Analysis conducted at the Paleo-DNA Laboratory, Northern Ontario Technology Center, Thunder Bay, Ontario

(Canada).

2003: Lucas Research Foundation Grant entitled DNA Degradation in Progressively

Burned Human Bone and Tissue: Recognition of Techniques for Optimal DNA Sequence Analysis. Research conducted with Ms. Elayne Pope, MA, University

of Arkansas and Dr. Frank Cipriano, Director, Conservation Genetics Laboratory, San Francisco State University, San Francisco, CA.

2003:

Laboratory research conducted to test the viability of ancient DNA with special concern to past conservation methods. Project conducted with Dr. Steve Gabow and Dr. Niccolo Caldararo from the Anthropology Department, and Dr. Joseph Romeo from the Clinical and Biomedical Laboratory Sciences Department at San Francisco State University, San Francisco, CA.

Special Skills:

- Familiar with mandates, guidelines, and legislation affecting archaeology/cultural resource management, and forensics (esp. ARPA, NEPA, CEQA, NHPA, NAGPRA, California Health and Safety Codes, esp. Divisions 7: Dead Bodies, 8: Cemeteries, and Division 102: Vital Records and Health Statistics).
- Computer skills: Microsoft Word, XP, MS Vista, Corel WordPerfect. Excel, PowerPoint, SPSS, EndNote, Fordisc 3.1, Calib 5.0.1., Sequencher, Paup, BioEdit, BioLign, and ClustalX.
- Administrative skills: data entry, typing, editing, fact-checking, business and scientific writing (generating technical reports, memos, manuscripts, syllabi, summaries, and scientific articles), public relations/journalism, reception, multiple phone lines, public speaking, filing, and excellent written and communication skills.
- Familiar with medical and dental terminology.
- Physical/Forensic Anthropologist. Experience in Osteology, Anatomy, and Dental Anthropology.
 Supervisory experience.
- Academic and Internet research and evaluation.
- Type 65 wpm.
- Experienced in the preservation and collection of evidence, including chain of custody.
- Proficient in all stages of the analysis of molecular samples (PCR, mtDNA, STRs). Experienced
 working with a variety of challenging samples, including ancient, degraded, inhibited, burned, and
 low template DNA. Cloning experience.
- Training completed in Occupational Safety and Health Administration Requirements, including Bloodborne Pathogen Standards, Biosafety Level 2 Training, and Biosafety in Microbiological and Biomedical Laboratories.
- Familiar with the equipment normally used in a morgue, and with orthopaedic surgical instrumentation.
- Proficient in the operation of Philips X-ray/Fluoroscope, Philips Mobile C-Arm, Philips Mobile 3-D C-Arm, and Orthoscan Mini C-Arm. Experience reading X-rays and CT scans.
- Completed FEMA Emergency Management Independent Study courses 100a, 200a, 700a, and 800b.

Professional Memberships:

- American Academy of Forensic Sciences
- Kenyon International Emergency Services, Team Member (under contract)

Languages:

- English (fluent)
- French (reading and basic conversational knowledge)
- Spanish (basic reading knowledge)

Teaching:

- Introduction to Biological Anthropology (Lecture and Laboratory)
- Human Osteology (Lecture and Laboratory)
- Introduction to Cultural Anthropology
- Anatomy Laboratory

References:

Dr. Joel D. Irish, Professor of Biological Anthropology, University of Alaska Fairbanks. Address: University of Alaska Fairbanks, Department of Anthropology, 310 Eielson Building, PO Box 757720, Fairbanks, AK. 99775-7720. Phone: (907) 474-7288 or (907) 474-6755. Email: ffjdi@uaf.edu.

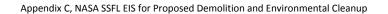
Dr. Jeffrey Boland Fentress, NAGPRA Coordinator, San Francisco State University, Department of Anthropology 1600 Holloway Ave. San Francisco, CA. 94132. Phone: (415)-338-3075 (NAGPRA office), Phone: (415)-338-2046 (Anthropology office), Fax: 415-338-3050. Email: fentress@sfsu.edu.

Dr. Steven A. Symes, Assistant Professor and Forensic Anthropologist, Mercyhurst Archaeological Institute, Mercyhurst College, Erie, PA. Address: Department of Applied Forensic Sciences Mercyhurst Archaeological Institute, Mercyhurst College, 119 Zurn Hall, Erie, PA. 16546 Phone: (814) 824-3369. Email: ssymes@mercyhurst.edu.

Dr. Frank Cipriano, Director Conservation Genetics Laboratory, Biology Department/Hensill Hall, San Francisco State University, 1600 Holloway Avenue, San Francisco CA. 94132. Phone: (415) 338-3453. Fax: (415)338-6245. Email: cipriano@sfsu.edu.

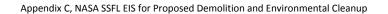
Ms. Sherri Gust, Principal Investigator/Project Manager Cogstone Resource Management, Inc., 1518 West Taft Avenue, Orange, CA. 92685. Phone: (714) 974-8300. Fax: (714) 974-8303. Email: sgust@cogstone.com

Mrs. Angela McArdle, Archaeologist. National Training Center/Fort Irwin. 8726 Anzio St. Fort Irwin, CA. 92310. Phone (910) 638-9777. Email: angela.bleggi@gmail.com



CONFIDEN	NTIAL Cu	ltural Res	Append ources M	ix D Iaps

Appendix C, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

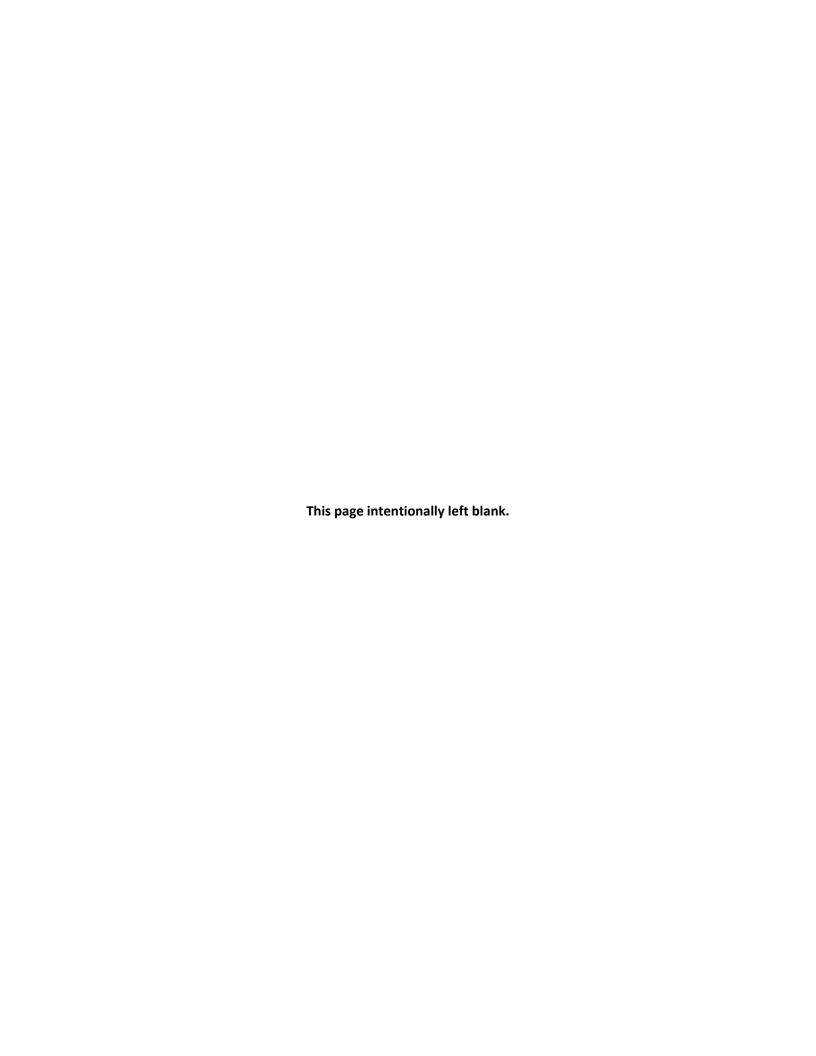


End of Appendix C



APPENDIX D

Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory



FINAL REPORT

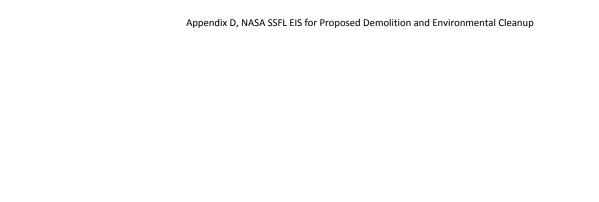
Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory



National Aeronautics and Space Administration Marshall Space Flight Center Huntsville, Alabama

February 2011







Final Report

Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory

National Aeronautics and Space Administration

George C. Marshall Space Flight Center Huntsville, Alabama

February 2011

Table of Contents

Secti	<u>on</u>	<u>Page</u>		
Table	e of Con	itentsii		
Acro	nyms	iv		
1	Intro	duction1-1		
2	Location and Environmental Setting			
	2.1	General 2-1		
	2.2	Physiography2-1		
	2.3	Geology2-4		
	2.4	Climate and Meteorology2-4		
3	Meth	ods3-1		
	3.1	General		
	3.2	Desktop Preparations3-2		
	3.3	Field Survey Detail		
4	Results4			
	4.1	Habitat Characterization and Mapping4-1		
	4.1.1	Natural Habitats4-1		
	4.1.2	Non-Natural Habitats4-6		
	4.2	Listed and Special-Status Species Surveys4-7		
	4.2.1	Plant Species4-7		
	4.2.2	Animal Species4-8		
	4.3	Wildlife Observations4-9		
5	Concl	lusions and Recommendations5-1		
	5.1	Conclusions5-1		
	5.2	Recommendations		
6	Refer	ences6-1		
<u>Appe</u>	<u>ndices</u>			
A	Habit	at Mapping		
В	Natural Community Datasheets			
C	Plant List			
D	Survey Photographs			
E	Species of Interest Mapping			
F	Santa Susana Tarplant Mapping			
G	Species of Interest Datasheets			
	-r			

List of Figures

Num	<u>ber</u>	
1	Regional Map	2-2
2	Site Overview	2-3
<mark>List 0</mark> Numl	<u>f Tables</u> ber	
1	—— Habitat Types Identified on NASA-Administered Property at SSFL During Fall 2010 Surveys	4-2
2	Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys	4-10
	· · · · · · · · · · · · · · · · · · ·	

Acronyms

CDFG California Department of Fish and Game

CNDDB California Natural Diversity Data Base

CNPS California Native Plant Society

°F Fahrenheit

FACW Facultative Wetland

ft Feet

msl Mean Sea Level

NASA National Aeronautics and Space Administration

NRMP Natural Resources Management Plan

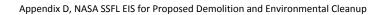
RCRA Resource Conservation and Recovery Act

RFI RCRA Facility Investigation

SOI Species of Interest

SSC Species of Special Concern

SSFL Santa Susana Field Laboratory

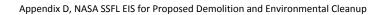


SECTION 1

Introduction

This report presents the findings of Fall 2010 habitat and listed species surveys conducted on National Aeronautics and Space Administration (NASA)-administered property at Santa Susana Field Laboratory (SSFL), located in southern California. SSFL was established shortly after World War II and has been used primarily as a site to develop and test nuclear reactors, rockets, and missiles. The site is 2,850 acres and is divided into four production and two buffer areas, (Area I, II, III, and IV, and the northern and southern buffer zones). A portion of SSFL is federally-owned property that is administered by NASA. The remaining property at SSFL is owned by the Boeing Company. NASA-administered property at SSFL consists of 40 acres within Area I and all 404 acres of Area II. The Boeing Company owns the remainder of Area I, all of Area III and Area IV, and the northern and southern buffer areas at the site.

The Fall 2010 surveys were conducted to support NASA's preparation of a Natural Resources Management Plan (NRMP) for the property it administers at SSFL. The primary tasks were to characterize/map natural communities; conduct species-specific and general (opportunistic) surveys for listed and special-status species; and develop plant and animal inventories. NASA conducted past ecological surveys on portions of the property it administers at SSFL in April 2008 and May 2009 as part of Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) (CH2MHILL, 2008, 2009, 2009a). The Fall 2010 surveys were intended to expand upon these past ecological surveys through survey of all NASA-administered property at SSFL, including those areas not previously surveyed outside the RFI areas. The findings of the surveys will be incorporated into the SSFL NRMP, which is being prepared by NASA to provide guidance on the management of natural resources on the property it administers at SSFL.



SECTION 2

Location and Environmental Setting

2.1 General

SSFL is located mostly within an unincorporated part of Ventura County, California; its easternmost portion extends slightly into an unincorporated part of Los Angeles County (Figure 1). The site is approximately 7 miles northwest of the community of Canoga Park and approximately 30 miles northwest of downtown Los Angeles. It encompasses 2,850 acres within a remote, mountainous area near the crest of the Simi Hills at the western border of the San Fernando Valley.

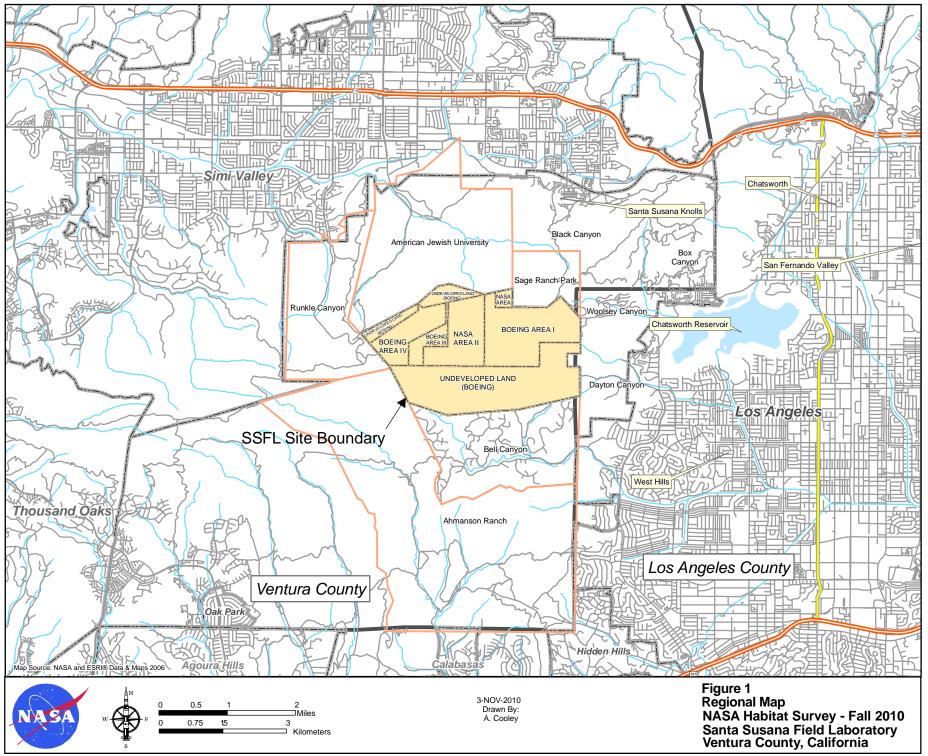
NASA-administered property at SSFL consists of 40 acres within Area I and all 404 acres of Area II (Figure 2). The Boeing Company owns the remainder of Area I, all of Area III and Area IV, and the northern and southern buffer areas at the site. Area II and Area I are located in the central and north-central parts of SSFL, respectively. NASA-administered property at SSFL represents approximately 15.6 percent of the total area of the site.

SSFL's landscape is dominated by sandstone outcropping hills. Numerous industrial facilities, man-made drainage systems, and roadways have been developed within this hilly landscape. The site is located within the central portion of the Southern California Coast ecological subregion in the Simi Valley – Santa Susana Mountains (261Be) ecological subsection (Miles and Goudey 1998). This subsection includes steep mountains, moderately steep to steep hills, and nearly level to gently sloping floodplains, terraces, and alluvial fans. The predominant natural plant communities in the area include California sagebrush series, Mixed sage series, Chamise series, Mixed scrub oak series, and Coast live oak series. There are small areas of California walnut series (Miles and Goudey 1998).

2.2 Physiography

SSFL is located within the Pacific Mountain System, Pacific Border Province, and Los Angeles Ranges (also known as the Transverse Ranges) physiographic region. Generally, the Transverse Ranges represent a complex of tectonic forces resulting from the interaction of the Pacific and the North American plates along the San Andreas Fault. The Transverse Ranges are oriented predominantly east-west and include the Santa Ynez Mountains, San Rafael Mountains, Sierra Madre Mountains, Topatopa Mountains, Santa Susana Mountains, Simi Hills, Santa Monica Mountains, San Gabriel Mountains, Puente Hills, Chino Hills, and San Bernardino Mountains.

The Transverse Ranges are characterized by extreme differences in geologic age and composition, varying from sedimentary rocks in the western Santa Ynez and Santa Monica Mountains to primarily granitic and metamorphic rock in the eastern regions, where they terminate abruptly in the San Gabriel and San Bernardino Mountains.



SSFL consists of hilly terrain that expresses approximately 1,100 feet (ft) of topographic relief. The highest surface elevation at SSFL exists near the center of the site at an approximate elevation of 2,245 ft above mean sea level (msl). The highest surface elevations at SSFL exist in two general bands that strike along a northeast-southwest trend, consistent with the geology of the area. The lowest elevation, which exists at the eastern property boundary, is approximately 1,175 ft above msl. The lower elevations at SSFL exist primarily along the eastern, southern, and north-central to northwestern perimeters of the property.

There are no natural lakes at SSFL. Streams occur within highly fractured breaks between uplifted and eroded rock formations. Small, isolated wetlands may occur in areas where seeps exist or runoff accumulates. Runoff is rapid and all streams are generally dry during summer.

2.3 Geology

SSFL is located in the Transverse Ranges of southern California, which are characterized by north-south compression that has produced geologic structures such as faults, synclines, and anticlines that are elongated in an east-west direction. The primary geologic units at SSFL are the Quaternary Alluvium and the Cretaceous Chatsworth Formation. The Chatsworth is overlain by the Simi Conglomerate Member of the Paleocene Santa Susana Formation in the northern part of the site, and is faulted against the Santa Susana Formation in the western part of the site. To the south, the Chatsworth is overlain by southward dipping late Tertiary formations. Structurally, SSFL is located on the southern flank of an east-west striking and westward plunging syncline that passes through the central part of the Simi Valley. These geologic formations are described below:

Quaternary Alluvium-Alluvial soils are generally thin and typically 5 to 15 ft thick at SSFL. Alluvial soils usually occur in topographic lows and along stream drainages. Disturbed soils also have been used as fill material in developed portions of SSFL. Thick fill soils (up to 35 to 40 ft) have been identified in the northeastern and north-central parts of SSFL. The alluvium generally consists of weathered Chatsworth Formation sediments and is usually a fine-grained silty sand.

Chatsworth Formation–Most of SSFL is underlain by the Cretaceous Chatsworth Formation, which consists of interbedded sandstone and shale. These sediments have been interpreted as deep-sea turbidite deposits. The Chatsworth Formation has been divided into the Lower Chatsworth Formation and the Upper Chatsworth Formation. The Upper Chatsworth Formation has been further subdivided into the Sandstone 1 and Sandstone 2 units.

2.4 Climate and Meteorology

Climate and meteorological data have been collected for SSFL since the 1960s. The climate falls within the Mediterranean sub-classification, and monthly mean temperatures range from 50 degrees Fahrenheit (°F) during the winter months to 70° F during the summer months (SAIC, 1994). During the summer months (April through October), an onshore wind pattern occurs because of the proximity of the adjacent Pacific Ocean; during the winter months, this pattern is interrupted by weather fronts (SAIC, 1994). Wind measurements collected at SSFL in 2003 indicate that the prevailing wind pattern is northwest-southeast (Sonoma Technology, Inc., 2003). This wind rose pattern is consistent with historical data collected in the 1960s and 1990s.

Precipitation at SSFL is normally in the form of rain, although snow occasionally falls during winter. Precipitation at the site has averaged approximately 18 inches per year between 1960 and 2006. During this period, the annual precipitation has ranged from a low of 5.7 inches in 2002 to a maximum of 41.2 inches in 1998. Most of the annual precipitation at SSFL occurs between November and March, which is consistent with the regional precipitation pattern of southern California.

Wildfires are common in the part of California where SSFL is located. A large portion of the SSFL was burned during the Topanga Fire of October 2005. Evidence of this fire was visible in the form of burned tree stumps and shrubs in many of the areas investigated during the Fall 2010 surveys. Crown sprouting was common where fire damage to native perennial vegetation was less severe. Previously burned annual vegetation, such as grasslands and ruderal areas, have been largely replaced with new growth since the 2005 fires.

SECTION 3

Methods

3.1 General

The Fall 2010 habitat and listed species surveys were conducted from September 28 to October 8, 2010 by two experienced CH2M HILL Inc. biologists. The primary tasks were to characterize/map natural communities; conduct species-specific and general (opportunistic) surveys for listed and special-status species; and develop plant and animal inventories on all of NASA-administered property at SSFL accessible by foot.

Natural communities encountered during the surveys were characterized and mapped. The approximate boundaries of each identified natural community were delineated on aerial photographs based on aerial photo-interpretation. Natural communities were characterized based on dominant plant species composition and information on each community was recorded on Natural Community Datasheets. Recorded data included dominant plant species, wildlife observations, and information on the habitat quality of each community. Assessments of habitat quality included identification of obvious impacts to the community, such as physical disturbance (including wildfire), hydrological impairments, and the presence of exotic/invasive species.

The species-specific survey was focused on the Braunton's milk-vetch (*Astragalus brauntonii*), which is a plant species that is federally listed as Endangered. Although this plant had not been sighted on NASA-administered property in the past, it is known to spread in response to wildfires and, therefore, was expected to have potentially recruited onto NASA-administered property following recent fires near SSFL.

General (opportunistic) surveys were conducted for other species that could be identified during the same time the milk-vetch survey was being conducted. The general surveys were designed to focus on those plant and animal species that have been documented to occur, or are expected to potentially occur, within or in the vicinity of SSFL during fall based on previous surveys and other data sources. Based on this approach, the general surveys were focused on the Santa Susana tarplant (*Deinandra minthornii*), which is state listed as Rare; non-chalky (i.e., without a white powdery bloom) species of dudleya (*Dudleya* spp.); and California black walnut (*Juglans californica*), which is not state or federally listed but is considered vulnerable due to overgrazing and habitat loss. Non-chalky species of dudleya were surveyed because they could potentially be listed or special-status species of dudleya, such as the Agoura Hills dudleya (*Dudleya cymosa* ssp. *agourensis*) or Conejo dudleya (*Dudleya parva*), both of which are federally listed as Threatened. Because dudleya species are not in bloom during fall, this approach was used to identify areas within the study area where listed species of dudleya could potentially occur.

In addition to the plant surveys, the general surveys included binocular surveys for raptor nests and surveys for rock basins and depressions that could potentially support listed fairy shrimp species. The rock basin surveys involved searches for basins that have adequate size and structure to potentially hold enough water during the wet season to potentially support fairy shrimp. The surveys did not include sampling of the basins to determine presence or absence of fairy shrimp. The existence of raptor nests on test stands and other man-made structures was assessed only by utilizing binoculars to minimize safety risks to survey

personnel. Survey personnel did not enter or climb onto any man-made structure during the surveys. The locations of targeted species sighted during the species-specific and general surveys were recorded by GPS (where accessible) and on aerial photographs. Information on targeted species identified, such as species description, habitat type, and other relevant observations, was recorded on Species of Interest (SOI) Datasheets.

3.2 Desktop Preparations

Desktop preparations for the field surveys included reviews of published reports on the ecology and habitats of California, including Miles and Goudey (1998), Sawyer et al. (2010), and Holland (1986). This information was used to develop a comprehensive understanding of the primary vegetation and habitat types expected to occur in the study area.

Desktop preparations also included reviews of previous ecological surveys conducted at SSFL (CH2MHILL, 2008, 2009, and 2009a; SAIC, 2009; and MWH, 2007), a search of the California Natural Diversity Data Base (CNDDB), and a review of the California Native Plant Society (CNPS) On-line Inventory of Rare and Endangered Plants (CNPS, 2010). Information from the previous ecological surveys and CNDDB search (CNDDB, 2008) were used to develop a tentative plant list to be used during the field surveys. Representative photographs of many of the species on the tentative plant list were obtained from the internet to facilitate field identification of plant species. The CNDDB occurrence data was rendered into a map that was used as a field aid during the surveys. The CNPS Inventory of Rare and Endangered Plants provided information on the flowering periods of listed and special-status plant species that could occur within the study area.

Ortho-rectified, 150-scale (1 inch = 150 ft) aerial photographs with overlain survey area boundaries were prepared as the base maps for the field surveys. These aerial photograph base maps were generated from the NASA GIS database using the following base datum coordinate system: NAD_1927_StatePlane_California_V_FIPS_0405. Vegetation mapping previously conducted for the entire SSFL site (TAIC, 2002) was also overlain onto the base maps to facilitate natural community characterization and mapping during the field surveys.

3.3 Field Survey Detail

The field surveys were conducted via systematic walking. Due to rugged terrain and impenetrable vegetation in some areas, transects were not used and not all areas were traversed; however, the foot surveys allowed view of most of the study area. The aerial photograph base maps were used in the field to delineate the habitats in the study area. The delineated habitats were subsequently digitized into the NASA GIS database and remapped onto the ortho-rectified aerial photograph base maps.

Because the field surveys were conducted during the months of September and October, many of the plants, especially flowering plants and grasses, were senescent, and migratory breeding birds were not present in the study area. The time spent at each site within the study area was limited; therefore, wildlife observations were opportunistic rather than systematic. Direct observations, calls, and signs of wildlife were recorded during the field surveys. Active survey techniques, such as the use of kicknets to identify benthic invertebrates or searches under logs, rocks, and debris for herpetiles were not used due to time constraints.

Field observations were recorded on Natural Community Datasheets and SOI Datasheets. Observations of listed and special-status species and sensitive habitat were also recorded on the aerial photograph base maps. Digital photographs were taken of species of interest and representative natural communities at the locations where corresponding datasheets were completed and the photographs were attached to the corresponding datasheets. Other photographs were taken of relevant site features and representative habitats to provide a visual record of conditions in the study area. The location of each digital photograph was mapped onto the aerial photograph base map. The following information was recorded for each photograph: date, name of the site, general description of the subject, and location of the photograph.

An area known to contain Braunton's milk-vetch is located in the southern part of Boeing Area IV (Figure 1). This species was sighted at this location during 2008 field surveys, so the same location was re-visited to determine the current physical appearance of the species. This reference observation was intended to calibrate the search image for this species on NASA-administered property during the Fall 2010 surveys. Known locations of Santa Susana tarplant at the ELV Site on NASA-administered property were also visited to inspect the current appearance of this species.

Locations of Santa Susana tarplants were recorded by taking a GPS point for each tarplant wherever they could be accessed. In cases where plants were small and tightly clustered, a single GPS point could represent one to five plants. Tarplants that could not be safely reached by foot were identified and counted using binoculars. These locations were pin-pricked on the base maps and their coordinates were later determined using GoogleTM Earth. In some areas, buildings and rock walls interfered with the GPS signal and limited satellite reception. Therefore, the GPS data collected for tarplants and other species/features has variable accuracy and all GPS locations should be considered approximate.

Locations of non-chalky dudleya and California black walnut were recorded by GPS. Because the dudleya plants were small and outside of their flowering period (senescent), a comprehensive survey of listed and special-status species of dudleya within the study area was not conducted. The GPS points taken of dudleya locations represent areas and habitats where listed and special-status species of dudleya could potentially occur within the study area.

GPS points were taken of rock basins that could potentially support fairy shrimp. However, given the range in size and continuity of rock basins within the study area, it is likely that all potentially suitable rock basins were not identified during the survey.

Voucher samples of plants that could not be identified in the field were collected in Ziploc bags for later identification using local taxonomic keys. The voucher plants were integrated with the field-identified plants for the study; however, it should be noted that many annual plants had senesced to a point that did not allow identification.

SECTION 4

Results

4.1 Habitat Characterization and Mapping

A variety of habitat types were characterized and mapped during the Fall 2010 surveys. Information on the habitat types identified during the surveys is presented in Table 1 and the habitat mapping is shown on the figures in Appendix A (Appendix A figures are based on the grid on Figure 2 and labels in Table 1). The Natural Community Datasheets with corresponding photographs completed for representative habitat types are provided in Appendix B.

Because most of the annual plants were in a state of senescence and not readily identifiable, a comprehensive inventory of plant species for the study area could not be developed during the Fall 2010 surveys. A list of plant species sighted during ecological surveys conducted as part of RFIs in April 2008 and May 2009 is provided as Appendix C. During the Fall 2010 surveys, the survey team sighted many of the same species identified during the April 2008 and May 2009 surveys, as well as four additional species not previously identified. These additional species are included in the plant list in Appendix C.

4.1.1 Natural Habitats

4.1.1.1 Baccharis Scrub

Baccharis scrub consists mostly of shrub vegetation that is dominated by coyote brush (*Baccharis pilularis*). The coverage of this habitat type on NASA-administered property at SSFL is relatively limited (2.62 total acres). Other designations for this habitat type include northern coyote brush scrub (CNDDB 1990), *Baccharis pilularis s*hrubland alliance, and coyote brush scrub (Sawyer et al. 2009). This habitat typically occurs in areas that are windy and exposed with shallow rocky soils (Holland 1986) and is often found on the sides of streams or on terraces (Sawyer et al. 2009). A photograph taken of this habitat type during the surveys is provided as Photo 1 in Appendix D.

Within the study area, coyote brush can be relatively dense and can occur in nearly pure stands, which is the case in the eastern part of the Bravo Site (Appendix A Figures A2- 9 and A2-10) and on the western and northern sides of the B515 STP Site (Appendix A Figure A2-12), or it can be relatively sparse, which is the case in the disturbed HWSA Site (Appendix A Figure A2-9).

4.1.1.2 Chaparral

Chaparral is the dominant habitat type on NASA-administered property at SSFL (172.63 total acres). This habitat type includes northern and southern mixed chaparral (CNDDB 1990). It is generally associated with dry, rocky, often steep slopes with little soil. Within the study area, chaparral is dominated by chamise (*Adenostoma fasciculatum*), thickleaf yerba santa (*Eriodictyon crassifolium*), and laurel sumac (*Malosma laurina*) with numerous interspersed sage (*Salvia* spp.) and other species. Poison oak (*Toxicodendron diversilobum*) in this habitat is primarily associated with dense vegetation along drainages. Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet D-CHP801 in Appendix B.

TABLE 1
Habitat Types Identified on NASA-Administered Property at SSFL During Fall 2010 Surveys

Label	Description ¹ Total Acreage	CNDDB Natural Community Designation ²	
Natural Habitats	3		
BS	Baccharis Scrub 2.62 acres	32110 Northern Coyote Brush Scrub	
CHP	Chaparral 172.63 acres	37110 Northern Mixed Chaparral 37120 Southern Mixed Chaparral	
CLORF	Coast Live Oak Riparian Forest 9.16 acres	61300 Southern Coast Live Oak Riparian Forest	
CLOW or CLO ³	Coast Live Oak Woodland 13.22 acres	71160 Coast Live Oak Woodland	
FWM	Freshwater Marsh 0.17 acres	52410 Coastal and Valley FWM	
MFS	Mulefat Scrub 2.09 acres	63310 Mulefat Scrub	
NNG	Non-native Grassland 18.62 acres	42200 Non-Native Grassland	
SS	Venturan Coastal Sage Scrub 64.44 acres	32300 Venturan Coastal Sage Scrub	
SWS	Southern Willow Scrub 1.04 acres	63320 Southern Willow Scrub	
WET	Undifferentiated Wetland 0.57 acres	NA	
Non-Natural Habitats			
DEV	Developed 58.10 acres	NA	
OW	Open Water 0.41 acres	NA	
RH	Ruderal 16.75 acres	NA	

NOTES:

- ¹ Vegetation classifications based on Holland (1986).
- ² California Natural Diversity Data Base (CNDDB) Natural Communities, November 1990.
- ³ CLO label used for free standing or small clusters of oak trees.

NA - Not Applicable. No corresponding designation in Holland (1986) for this type.

When multiple habitats occur in a mosaic within the mapping unit, the dominant habitat type (based on proportion of cover) is listed first. Estimated acreages are based on the dominant habitat type.

Total area of all mapped habitat types is 444.3 acres.

Habitat Unit Modifiers on Appendix A Figures:

- RO Rock Outcrop area. May occur by itself or is co-located with other vegetation types. Total rock outcrop area with no significant co-located habitat type is 84.47 acres.
- D Disturbed, either due to previous clearing or wildlife.

Northern mixed chaparral typically consists of tall (6.5 to 13 ft), dense to nearly impenetrable vegetation on north-facing slopes in southern California (Holland 1986). Within the study area, this habitat type was identified in the vicinity of the LOX Site in Area I (Appendix A Figure A1-1); north of the Area II Landfill (Appendix A Figure A2-17); south of the roadway between the Area II Landfill and Alfa Site (Appendix A Figures A2-13, A2-14, and A2-17); and north of Skyline Road in Area II (Appendix A Figures A2-6, A2-7, and A2-8).

Most of the chaparral on NASA-administered property at SSFL is southern mixed chaparral, which is similar in species composition to northern mixed chaparral but is typically not as dense or tall (5 to 10 ft). Southern mixed chaparral has occasional patches of bare soil or forms a mosaic with Venturan coastal sage scrub (Holland 1986). These habitats were identified on slopes of various aspects within the study area.

4.1.1.3 Coast Live Oak Riparian Forest

Coast live oak riparian forest is limited to the largest canyons and drainages on NASA-administered property at SSFL (9.16 total acres). Mature coast live oak (*Quercus agrifolia*) is the dominant canopy species in this habitat type. The ground cover in this habitat is typically dominated by various grasses and mugwort (*Artemisiadouglasiana*). The shrub layer is typically poorly developed (Holland 1986); however, poison oak was common near drainage channels in this habitat in the study area. A photograph taken of this habitat type during the surveys is provided as Photo 2 in Appendix D.

Another designation for coast live oak riparian forest (as well as for coast live oak woodland described below) is *Quercus agrifolia* woodland alliance (Sawyer et al. 2009). This habitat type is associated with alluvial terraces, canyon bottoms, stream banks, slopes and flats with deep sandy or loamy soils with high organic matter. Because of its thick bark, coast live oak is exceptionally resistant to periodic wildfires.

Within the study area, coast live oak riparian forest was identified in the drainage south and west of the LOX Site (Appendix A Figure A1-1); in the drainages southwest of the R-2 Ponds and north of the Delta Site (Appendix A Figures A2-1 and A2-2); in the drainage west of the CDFF Site (Appendix A Figure A2-5); along the roadway northwest of the Bravo Site (Appendix A Figure A2-9); and west and northwest of the Area II Landfill (Appendix A Figures A2-16 and A2-17).

4.1.1.4 Coast Live Oak Woodland

Coast live oak woodland is a relatively widespread, although not extensive, habitat type on NASA-administered property at SSFL (13.22 total acres). It occurs in areas not associated with a canyon or major drainage where mature coast live oak is the dominant canopy species. This habitat type also includes individual or small groups of trees that are probably remnants of formally more extensive oak woodlands or riparian forests. It typically occurs on north-facing slopes in southern California (Holland 1986). Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet CLOW801 in Appendix B. A photograph taken of this habitat type during the surveys is provided as Photo 3 in Appendix D.

As with coast live oak riparian forest, the shrub layer in coast live oak woodland is poorly developed. Within the study area, the shrub layer, where present, included blue elderberry (*Sambucus mexicana*) and poison oak. The herbaceous layer was dominated by various grasses such as wild oats (*Avena fatua*) and ripgut brome (*Bromus diandrus*), and by weedy

species such as milk thistle (*Silybum marianum*), Italian thistle (*Carduus pycnocephalus*), and cobweb thistle (*Cirsium occidentale*).

Within the study area, coast live oak woodland was identified in the drainage south and west of the LOX Site (Appendix A Figure A1-1); in the large meadow southwest of the Delta Site (Appendix A Figure A2-1); west and northwest of the Bravo Site (Appendix A Figure A2-9); and north and northeast of the ELV Site (Appendix A Figures A2-15 and A2-16). Individual and small clusters of coast live oaks exist throughout the study area.

4.1.1.5 Freshwater Marsh

Freshwater marsh habitat on NASA-administered property at SSFL is associated only with artificial stormwater detention basins that have been constructed along natural drainageways (0.17 total acres). Emergent wetland vegetation has developed within these basins with cattail (*Typha latifolia*) being the dominant plant species. Freshwater marsh typically exists in the wettest portions of the basins adjacent to the open water habitat. Slightly drier margins of the ponds are dominated by common reed (*Phragmites australis*). The adjacent upland banks of these basins are covered mostly by willow trees and shrubs (*Salix* spp.). Freshwater marshes lack significant current and are permanently flooded by fresh water rather than water that is brackish, alkaline, or variable (Holland 1986).

Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet FWM-OW01 in Appendix B. Within the study area, freshwater marsh was identified around the R-2 Ponds (Appendix A Figures A2-1 and A2-5) and the detention basin north of the Coca Site (Appendix A Figure A2-2).

4.1.1.6 Mulefat Scrub

Mulefat scrub is a relatively limited habitat type on NASA-administered property at SSFL (2.09 total acres). Mulefat scrub consists mostly of shrub vegetation that is dominated by mulefat (*Baccharis salicifolia*). Other designations for this habitat type include *Baccharis salicifolia* shrubland alliance and mulefat thickets (Sawyer et al. 2009). This habitat type is typically associated with intermittent stream channels with fairly coarse-textured soils, and is maintained by frequent flooding (Holland 1986). Mulefat scrub occurs in canyon bottoms, floodplains, irrigation ditches, lake margins, and stream channels. Mulefat is designated as a "Facultative Wetland" (FACW) plant species by the U.S. Fish and Wildlife Service. The FACW designation indicates that the species usually occurs in wetlands (67 – 99 percent probability), and occasionally occurs in non wetlands.

Within the study area, mulefat scrub was identified around the R2-Ponds (Appendix A Figures A2-1 and A2-5); north and northeast of the Coca Site (Appendix A Figures A2-3 and A2-4); on the northeastern side of the Bravo Site (Appendix A Figure A2- 9 and A2-10); north of the LOX Site (Appendix A Figure A1-1); and south of the ELV parking lot (Appendix A Figure A2-16).

4.1.1.7 Non-native Grassland

Non-native grassland is a relatively widespread habitat type on NASA-administered property at SSFL (18.62 total acres). This habitat type is characterized by dense to sparse cover of annual grasses that are between 0.6 and 3.3 ft in height. The grass cover is often associated with numerous species of native annual forbs (i.e., showy wildflowers) especially in years of favorable rainfall. With a few exceptions, the plants in this habitat are dead through the summer-fall dry season (Holland 1986). Information collected on a

representative of this habitat type during the surveys is documented on Natural Community Datasheets NNG801 and RO-NNG in Appendix B. Photographs taken of this habitat type during the surveys are provided as Photos 4 through 7 in Appendix D.

Within the study area, the grasses in this habitat type consist of slender oat (*Avena barbata*), wild oat, red brome (*Bromus madritensis* spp. *rubens*), ripgut brome, and wild rye (*Lolium multiflorum*). Non-native grassland occurs throughout the study area in a mosaic with chaparral, sage scrub, and rock outcrops (Appendix D Photo 4). This habitat type is also associated with dove weed (*Eremocarpus setigerus*) and telegraph weed (*Heterotheca grandiflora*) (Appendix D Photo 5) and occurs in patches on eroded rock outcrop slopes (Appendix D Photo 6).

Within the study area, large, nearly pure grasslands were identified in the southwestern portion of Area II (Appendix A Figure A2-1) and within undisturbed ravines between uplifted rock outcrops (Appendix A Figures A2-1, A2-4, A2-6, A2-7, A2-8, A2-10, A2-11, and A2-13). This habitat type also occurs within or adjacent to coast live oak woodland (Appendix D Photo 7), such as in the area between the ELV Site and Alfa Site (Appendix A Figure A2-13).

4.1.1.8 Venturan Coastal Sage Scrub

Venturan coastal sage scrub is a relatively widespread habitat type on NASA-administered property at SSFL (64.44 total acres). This habitat type is characterized by lower (1.6 to 6.6 ft) and less dense vegetation than that which exists in chaparral habitat. Most of the flowering in this habitat type occurs during spring and early summer and the plants are mostly dormant during late summer through early fall. This habitat type often occurs on dry, rocky slopes and many of the plant species are adapted to fire via crown sprouting (Holland 1986). Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet D-SS01 in Appendix B. Photographs taken of this habitat type during the surveys are provided as Photos 8 through 10 in Appendix D.

Within the study area, Venturan coastal sage scrub consists of thickleaf yerba santa, California buckwheat (*Eriogonum fasculatum*), deer weed (*Acmispon glaber*), purple sage (*Salvia leucophylla*), black sage (*Salvia mellifera*), and chaparral yucca (*Yucca whipplei*). This habitat type was identified throughout the undeveloped portions of the study area, often in a mosaic with chaparral and rock outcrops (Appendix D Photo 10). Some of this habitat was observed to be disturbed by wildfire or by clearing where adjacent to developed areas. The largest areas of non-disturbed habitat within the study area was found in the southwestern portion of Area II (Appendix A Figure A2-1); near the ABFF Site (Appendix A Figure A2-12); north of the Alfa Site (Appendix A Figures A2-13 and A2-14); and east of the ELV Site parking lot (Appendix A Figure A2-16). In areas where past fires had completely removed the vegetation, some of the re-growth was dominated by deer weed. An example of this case was observed near the detention pond at the Coca Site (Appendix D Photo 8).

4.1.1.9 Southern Willow Scrub

Southern willow scrub is a relatively limited habitat type on NASA-administered property at SSFL (1.04 total acres). It is a wetland habitat that is associated with drainages and more permanent water sources. Photographs taken of this habitat type during the surveys are provided as Photos 11 and 12 in Appendix D.

Within the study area, arroyo willow (*Salix lasiolepis*) is the most common willow species within this habitat type; however, red willow (*Salix laevigata*) and narrow-leaved willow

(*Salix exigua*) also occur in some areas. Small areas of southern willow scrub were identified in the drainage north of the Area II Landfill (Appendix A Figure A2-17); in the drainage north of the Coca Site (Appendix A Figure A2-3); around the R-2 Ponds (Appendix A Figures A2-1 and A2-5); and around the Coca Site detention pond (Appendix A Figure A2-2; Appendix D Photo 12). The largest area of southern willow scrub within the study area was identified in the drainage on the southern side of the Alfa Site (Appendix A Figures A2-10, A2-13, and A2-14).

4.1.1.10 Undifferentiated Wetland

Undifferentiated wetland habitat is a limited habitat type on NASA-administered property at SSFL (0.57 total acres). Within the study area, this habitat type occurs in small areas where restricted drainage traps and ponds water for long enough periods to support wetland vegetation. Most of the wetlands within the study area hold water seasonally and are usually dry during fall and winter. Within the study area, common reed is the dominant wetland plant species in this habitat type. Photographs taken of this habitat type during the surveys are provided as Photos 13, 14, and 15 in Appendix D. Undifferentiated wetland habitat was identified in six areas within the study area (Appendix A Figures A1-2, A2-2, A2-13, and A2-14).

4.1.2 Non-Natural Habitats

4.1.2.1 Developed

Developed areas on NASA-administered property at SSFL consist of buildings, paved roadways, parking areas, and other development. This category also includes unpaved (dirt or gravel) roadways in more remote areas of the site. Developed areas total 58.10 acres on NASA-administered property at SSFL.

In some cases, long disused facilities, such as old roadways or parking areas, have reverted to disturbed natural communities with varying amounts of vegetation cover. Examples of these areas include the roadways northwest of the Coca Site (Appendix A Figure A2-6) and the old parking area southwest of the ELV Site (Appendix A Figure A2-12).

4.1.2.2 Open Water

Open water habitat on NASA-administered property at SSFL is restricted to two stormwater detention basins: the R-2 Ponds (Appendix A Figures A2-1 and A2-5) and the detention basin west of the Coca Site (Appendix A Figure A2-2). There are 0.41 total acres of open water habitat within study area. Photographs taken of this habitat type during the surveys are provided as Photos 16 and 17 in Appendix D.

4.1.2.3 Ruderal

Ruderal habitats are areas with varying amounts of vegetation cover that have experienced man-made disturbance. Within the study area, this habitat type is dominated by weedy and invasive plant species that include red-stem filaree (*Erodium cicutarium*), mustard (*Brassica* spp.), deer weed, and telegraph weed. Ruderal areas total 16.75 acres on NASA-administered property at SSFL. Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet RH801 in Appendix B. A photograph taken of this habitat type during the surveys is provided as Photo 18 in Appendix D.

Examples of large areas of ruderal habitat identified within the study area include previously cleared or restored (capped) areas that have re-vegetated such as the LOX Site (Appendix A Figure A1-1; Appendix D Photo 18); the cap near the R-2 Ponds (Appendix A Figures A2-1 and A2-5); the cap north of the Bravo Site (Appendix A Figure A2-9); and the areas south of the roadway in the vicinity of the Alfa Site (Appendix A Figure A2-13). Numerous small areas of ruderal habitat exist throughout the study area along roadways where herbicide spraying is conducted, or near existing buildings and other development.

4.2 Listed and Special-Status Species Surveys

4.2.1 Plant Species

Braunton's milk-vetch and Santa Susana tarplant are the only two listed/special-status plant species documented by the CNDDB in the vicinity of the study area (Appendix E Figure E-1). Braunton's milk vetch is federally listed as Endangered and the Santa Susana tarplant is state listed as Rare. The other documented plant species occurrences in the vicinity of the study area shown on the CNDDB map are of species that are neither listed nor have special status.

As discussed in Section 3.3, an area in the southern part of Boeing Area IV known to contain Braunton's milk-vetch was visited prior to the Fall 2010 surveys to determine the physical appearance of this species at the time. The Braunton's milk-vetch occurrence location shown on the CNDDB map does not correspond with the known location for this species in Boeing Area IV. The occurrence location is shown on the CNDDB map to be in NASA Area II. It is possible that the documented occurrence is the same as the known location in Boeing Area IV because occurrence locations on the CNDDB map have a spatial accuracy variability of one-mile radius.

All inspected specimens of Braunton's milk vetch in Boeing Area IV were in a state of senescence (Appendix D Photo 19). Nearly all the leaves had fallen off of the plants; the few leaves remaining on the stems were dried and curled. The stems, which were dry and grey, were either intact and approximately 2 or 3 ft in height or were broken and shorter (approximately 1 ft in height). No specimens of Braunton's milk-vetch were sighted in the general area of the CNDDB occurrence location or anywhere else on NASA-administered property at SSFL during the Fall 2010 surveys.

Based on inspections of Santa Susana tarplants at a known location at the ELV Site on NASA-administered property, all specimens were observed to be in bloom (Appendix D Photo 20). Santa Susana tarplants were sighted in 3,657 locations within the study area. Of these locations, only 324 were found in Area II, all of which were on the sandstone outcrops north of the LOX Site (Appendix F Figures A1-01 and A1-02). The overwhelming majority of the Santa Susana tarplants (3,333 locations or 91 percent of the total) were sighted in Area II, where they were widespread throughout the area in association with sandstone outcrop habitat (Appendix F Figures A2-01 through A2-17). Information collected on two of the Santa Susana tarplant locations is documented on SOI Datasheets ST01 and ST14 in Appendix G.

As discussed in Section 3, the dudleya surveys focused on non-chalky species of dudleya because non-chalky specimens could potentially be listed or special-status species. Photographs of non-chalky and chalky specimens of dudleya are provided as Photos 21 and 22, respectively in Appendix D. Because the dudleya plants are not in bloom during fall, a comprehensive survey of listed and special-status species of dudleya within the study area

was not conducted. The GPS points taken of dudleya locations represent areas and habitats where listed and special-status species of dudleya could potentially occur within the study area. A spring dudleya survey is recommended to provide a more comprehensive assessment of listed and special-status species of dudleya within the study area.

Non-chalky dudleya plants were sighted in 30 locations within the study area, all of which were in Area II (Appendix E Figure E-2). The plants were almost exclusively associated with remnant patches of grasses located on north-facing sandstone slopes (Appendix D Photos 23 and 24), such as the grass patches on the northern and southern sides of Skyline Road and on the slopes south of the Coca and Delta Sites (Appendix E Figure E-2). These small patches of grass are believed to be remnants of more extensive grass cover on these slopes that has been disturbed by human activity and has subsequently eroded. An alternative, but less likely, theory is that these patches of grass have established within pockets of accumulated sediment (colluvium) within cracks and microtopographic basins on the sandstone slope surface. Information collected on one of the dudleya locations is documented on SOI Datasheet Dud801in Appendix G.

Three individual California black walnut trees were sighted within the study area. Two of the walnut trees were co-located near the Bravo Site and one tree was located within a narrow canyon on the northern side of Skyline Road (Appendix E Figure E-2).

4.2.2 Animal Species

No listed or special-status wildlife species occurrences are documented by the CNDDB within or in the immediate vicinity of the study area or SSFL (Appendix E Figure E-1). Three California Department of Fish and Game (CDFG) Species of Special Concern (SSC) occurrences are documented by the CNDDB within the general vicinity of SSFL: western spadefoot toad (*Spea hammondii*), arroyo toad (*Anaxyrus californicus*), San Diego desert woodrat (*Neotoma lepida intermedia*), tricolored blackbird (*Agelaius tricolor*), and western mastiff bat (*Eumops perotis californicus*). The arroyo toad is also federally listed as Endangered. No evidence was found during the surveys indicating the potential occurrence of any of these species except for potentially the San Diego desert woodrat. Evidence of potential occurrence of woodrat species was found during the surveys; however, the species of woodrats in the study area could not be identified because no species-specific surveys were conducted.

One SSC reptile species, one SSC bird species, and one fully protected mammal species were sighted, and one federally Endangered butterfly species was potentially sighted, within the study area during the surveys. No occurrences of these species within the vicinity of SSFL are documented by the CNDDB.

The SSC reptile species sighted within the study area was the coast horned lizard (*Phrynosoma coronatum* (*blainvillii* population). Two individuals of this species were sighted, one in ruderal habitat on the Area II Landfill (Appendix E Figure E-3) and one in rock outcrop habitat north of the LOX Site in Area I (Appendix E Figure E-4). Both lizards were juveniles; one was approximately 1.5 inches in length and the other was approximately 1 inch in length. Information collected on these sightings is documented on SOI Datasheets HL01 and HL02 in Appendix G.

The SSC bird species sighted within the study area was the loggerhead shrike (*Lanius ludovicianus*). One individual loggerhead shrike was sighted flying across the road toward the eastern side of the SPA Site in Area II (Appendix E Figure E-3).

The fully protected mammal species sighted within the study area was the ring-tailed cat (*Bassariscus astutus*). One individual ring-tailed cat was sighted on a rock outcrop near a riparian drainage northwest of the SPA Site (Appendix E Figure E-3). The "fully protected" classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Species that have this classification cannot be taken or possessed at any time.

The Quino checkerspot butterfly (*Euphydryas editha quino*), which is federally listed as Endangered, was potentially sighted within the study area. One individual butterfly that may have been this species was sighted southwest of the Bravo Site in mosaic habitat consisting of rock outcrop, non-native grassland, and Venturan coastal sage scrub (Appendix E Figure E-2). The butterfly was observed in flight and a positive identification was not possible. It was rust/orange colored and had white markings on its wings. The butterfly did not land long enough for a positive identification or photograph. It flew away in a zig-zag pattern similar to that described for male Quino checkerspot butterflies. Information collected on this sighting is documented on SOI Datasheet QCB01 in Appendix G.

4.3 Wildlife Observations

Observations of wildlife within the study were recorded during the Fall 2010 surveys. The animal species identified within the study area via sightings, calls, and other evidence of occurrence are listed in Table 2. As indicated in Table 2, 7 herpetile (reptiles and amphibians) species, 51 bird species, and 10 mammal species were identified during the surveys. Some animal species may not occur within the study area during fall, such as certain migratory bird species; therefore, a spring wildlife survey is recommended to provide a more comprehensive inventory of wildlife within the study area.

Signs of occurrence of the California mule deer (*Odocoileus hemionus californicus*) (Appendix D Photo 25) and wild pig (*Sus scrofa*), and of their predators, such as the mountain lion (*Felis concolor*) and bobcat (*Felis rufus*), were found throughout the study area. The types of wildlife that are supported by the various habitats within the study area can be assessed based on the field observations made during the surveys. It is important to note that the ecotones between the habitats are important to wildlife, especially for foraging, and the majority of animal species are not restricted to the habitat type that they may be most associated with.

Grasslands and some ruderal habitats within the study area support a variety of small mammals and provide important foraging and nesting habitat for raptors and other birds. Birds that forage in grasslands include the red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and loggerhead shrike (*Lanius ludovicianus*). Ground nesting birds utilize grasslands and to a certain extent, ruderal habitats, including the western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), and savannah sparrow (*Passerculus sandwichensis*). Graveled areas associated with ruderal habitats can provide ground nesting opportunities for species such as the killdeer (*Charadrius vociferus*). Ruderal vegetation occurring within and along the margins of disturbed areas are often utilized by birds such as the American goldfinch (*Carduelis tristis*), house finch (*Carpodacus mexicanus*), and Brewer's blackbird (*Euphagus cyanocephalus*). Mammal species that occur in grasslands and ruderal habitats include the cottontail rabbit (*Sylvilagus* sp.), California ground squirrel (*Spermophilus beecheyi*), and Botta's pocket gopher (*Thomomys bottae*). Rodent burrows in these habitats provide essential upland refuge sites for certain amphibians and reptiles,

including the western toad (*Anaxyrus boreas*) and western fence lizard (*Sceloporus occidentalis*).

TABLE 2Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys

Common Name	Scientific Name	
Herpetiles		
Western Toad	Anaxyrus [Bufo] boreas	
Coast Horned Lizard	Phrynosoma blainvillii	
Western Fence Lizard	Sceloporus occidentalis	
California Whiptail	Aspidoscelis tigris munda	
Mountain Gartersnake	Thamnophis elegans elegans	
Ring-necked Snake	Diadophis punctatus	
Western Rattlesnake	Crotalus oreganus helleri	
Birds		
Mallard	Anas platyrhynchos	
California Quail	Callipepla californica	
Great Blue Heron	Ardea herodias	
Green Heron	Butorides virescens	
Turkey Vulture	Cathartes aura	
Cooper's Hawk	Accipiter cooperii	
Red-shouldered Hawk	Buteo lineatus	
Red-tailed Hawk	Buteo jamaicensis	
American Kestrel	Falco sparverius	
Rock Pigeon	Columba livia	
Band-tailed Pigeon	Patagioenas fasciata	
Mourning Dove	Zenaida macroura	
White-throated Swift	Aeronautes saxatalis	
Black-chinned Hummingbird	Archilochus alexandri	
Anna's Hummingbird	Calypte anna	
Rufous/Allen's Hummingbird	Selasphorus rufus/sasin	
Belted Kingfisher	Megaceryle alcyon	
Acorn Woodpecker	Melanerpes formicivorus	
Nuttall's Woodpecker	Picoides nuttallii	
Northern Flicker	Colaptes auratus	
Black Phoebe	Sayornis nigricans	

TABLE 2Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys

Say's Phoebe Sayornis saya Loggerhead Shrike Lanius Iudovicianus Cassin's Vireo Vireo cassinii Western Scrub-Jay Aphelocoma californica American Crow Corvus brachyrhynchos Common Raven Oak Titmouse Baeolophus inornatus Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Wellow-rumped Warbler Wilson's Warbler Wilson's Warbler Wilson's Warbler Wilson's Warbler Wilson's Warbler Alimonia Towhee Alimonia Towhee Alimonia Towhee Alimonia Towhee Alimonia Towhee Pipilo maculatus California Towhee Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals Desert Cottontail Sylvilagus audubonii	Common Name	Scientific Name
Cassin's Vireo Vireo cassinii Western Scrub-Jay Aphelocoma californica American Crow Corvus brachyrhynchos Common Raven Corvus corax Oak Titmouse Baeolophus inornatus Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Sitta pygmaea Rock Wren Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Oporornis tolmiei Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus Mammals	Say's Phoebe	Sayornis saya
Western Scrub-Jay Aphelocoma californica American Crow Corvus brachyrhynchos Common Raven Corvus corax Oak Titmouse Baeolophus inornatus Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Sitta pygmaea Rock Wren Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Oporomis tolmiei Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii Whit	Loggerhead Shrike	Lanius Iudovicianus
American Crow Common Raven Corvus corax Oak Titmouse Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Passerella iliaca Lincoln's Sparrow Melospiza Incolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	Cassin's Vireo	Vireo cassinii
Common Raven Corvus corax Oak Titmouse Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Sitta pygmaea Rock Wren Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Wilson's Warbler Wilson's Warbler Wilson's Warbler California Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	Western Scrub-Jay	Aphelocoma californica
Oak Titmouse Baeolophus inornatus Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Sitta pygmaea Rock Wren Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Oporornis tolmiei Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis </td <td>American Crow</td> <td>Corvus brachyrhynchos</td>	American Crow	Corvus brachyrhynchos
Bushtit Psaltriparus minimus White-breasted Nuthatch Sitta carolinensis Pygmy Nuthatch Sitta pygmaea Rock Wren Salpinctes obsoletus Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Oporornis tolmiei Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis	Common Raven	Corvus corax
White-breasted Nuthatch Pygmy Nuthatch Sitta pygmaea Rock Wren Salpinctes obsoletus Canyon Wren Bewick's Wren Thryomanes bewickii House Wren Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Yellow-rumped Warbler Wilson's Warbler Wilson's Warbler Warbous-crowned Sparrow Lark Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Mammals	Oak Titmouse	Baeolophus inornatus
Pygmy Nuthatch Rock Wren Salpinctes obsoletus Canyon Wren Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Yellow-rumped Warbler Wilson's Warbler Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Lark Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	Bushtit	Psaltriparus minimus
Rock Wren Canyon Wren Catherpes mexicanus Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Wilson's Warbler Wilson's Warbler Wilson's Warbler Pipilo maculatus California Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	White-breasted Nuthatch	Sitta carolinensis
Canyon Wren Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Wilson's Warbler Wilson's Warbler Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	Pygmy Nuthatch	Sitta pygmaea
Bewick's Wren Thryomanes bewickii House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Oporornis tolmiei Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Rock Wren	Salpinctes obsoletus
House Wren Troglodytes aedon Wrentit Chamaea fasciata Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Vermivora celata Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis	Canyon Wren	Catherpes mexicanus
Northern Mockingbird Northern Mockingbird Mimus polyglottos California Thrasher Toxostoma redivivum Orange-crowned Warbler Yellow-rumped Warbler MacGillivray's Warbler Wilson's Warbler Spotted Towhee California Towhee Rufous-crowned Sparrow Lark Sparrow Passerella iliaca Lincoln's Sparrow House Finch California Towhee California Towhee Carpodacus mexicanus American Goldfinch Mimus polyglottos Mermival polyglottos M	Bewick's Wren	Thryomanes bewickii
Northern Mockingbird California Thrasher Toxostoma redivivum Orange-crowned Warbler Yellow-rumped Warbler MacGillivray's Warbler Wilson's Warbler Spotted Towhee Rufous-crowned Sparrow Lark Sparrow Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Mimus polyglottos Toxostoma redivivum Nelospica tomicia Vermivora celata Toxonata Pascrolatia Wilson's Varbler Wilsonia pusilla Wilsonia pusilla Pipilo maculatus Aimophila ruficeps Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis	House Wren	Troglodytes aedon
California Thrasher Orange-crowned Warbler Yellow-rumped Warbler MacGillivray's Warbler Wilson's Warbler Spotted Towhee California Towhee Rufous-crowned Sparrow Lark Sparrow Fox Sparrow Lincoln's Sparrow House Finch Carpodacus mexicanus American Goldfinch Vermivora celata Vellata Vel	Wrentit	Chamaea fasciata
Orange-crowned Warbler Yellow-rumped Warbler Dendroica coronata MacGillivray's Warbler Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	Northern Mockingbird	Mimus polyglottos
Yellow-rumped Warbler MacGillivray's Warbler Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow American Goldfinch Spinus tristis Mammals	California Thrasher	Toxostoma redivivum
MacGillivray's Warbler Wilson's Warbler Wilsonia pusilla Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Orange-crowned Warbler	Vermivora celata
Wilson's Warbler Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Yellow-rumped Warbler	Dendroica coronata
Spotted Towhee Pipilo maculatus California Towhee Melzone crissalis Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	MacGillivray's Warbler	Oporornis tolmiei
California Towhee Rufous-crowned Sparrow Aimophila ruficeps Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Wilson's Warbler	Wilsonia pusilla
Rufous-crowned Sparrow Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Spotted Towhee	Pipilo maculatus
Lark Sparrow Chondestes grammacus Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	California Towhee	Melzone crissalis
Fox Sparrow Passerella iliaca Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Rufous-crowned Sparrow	Aimophila ruficeps
Lincoln's Sparrow Melospiza lincolnii White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Lark Sparrow	Chondestes grammacus
White-crowned Sparrow Zonotrichia leucophrys House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Fox Sparrow	Passerella iliaca
House Finch Carpodacus mexicanus American Goldfinch Spinus tristis Mammals	Lincoln's Sparrow	Melospiza lincolnii
American Goldfinch Spinus tristis Mammals	White-crowned Sparrow	Zonotrichia leucophrys
Mammals	House Finch	Carpodacus mexicanus
	American Goldfinch	Spinus tristis
Desert Cottontail Sylvilagus audubonii	Mammals	
	Desert Cottontail	Sylvilagus audubonii

TABLE 2Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys

Common Name	Scientific Name
California Ground Squirrel	Spermophilus beecheyi
Ring-tail cat	Bassariscus astutus
Raccoon	Procyon lotor
Coyote	Canis latrans
Bobcat	Felis rufus
Mountain lion	Felis concolor
California Mule Deer	Odocoileus hemionus californicus
Wild Pig	Sus scrofa
Vole species	Microtus sp.

Wooded areas within the study area provide foraging, nesting, and shelter habitat for many bird and mammal species. Birds that occur in wooded areas include the Cooper's hawk (*Accipiter cooperii*), oak titmouse (*Baeolophus inornatus*), nuthatches (*Sitta* spp.), and woodpeckers. A variety of warbler and vireo species are also expected to occur in the woodlands within the study area during the breeding season. Mammals, including various rodent species (e.g., *Peromyscus* spp., *Perognathus* spp., and *Mus musculus*), fox (e.g., *Urocyon cinereoargenteus* and *Vulpes* sp.), mule deer, and bobcat use the woodlands within the study area for foraging and denning.

Rock outcrops within the study area serve as breeding habitat for a variety of birds and mammals, and also provide cover for small mammals, reptiles, and amphibians. Rock outcrops can serve as nesting habitat for raptor species including the red-tailed hawk, for owls including the barn owl (*Tyto alba*), and for other birds such as the rock wren (*Salpinctes obsoletus*). Rock outcrops also provide cover and nesting habitat for small mammals including the cottontail rabbit and California ground squirrel, and for reptiles including the California whiptail (*Aspidoscelis tigris munda*) and western rattlesnake (*Crotalus oreganus heller*) (Appendix D Photo 26). Reptiles and small mammals attracted to rock outcrops provide prey opportunities for larger mammals including the coyote (*Canis latrans*), bobcat, and foxes, and for raptors.

Basins and depressions on rock outcrops that are inundated during the wet season could potentially support listed fairy shrimp species. Based on available information, several listed fairy shrimp species are considered to have the potential to occur in seasonally inundated pools on rock outcrops in the study area. Listed fairy shrimp species known to occur on rock outcrops in southern California include the federally Endangered longhorn fairy shrimp (*Branchinecta longiantenna*) and the federally Threatened vernal pool fairy shrimp (*Branchinecta lynchi*). The federally Endangered Riverside fairy shrimp (*Streptocephalus woottoni*) was addressed in a 2010 USFWS Biological Opinion prepared for a proposed remediation project on Boeing's property at SSFL. The Biological Opinion concluded that the project would have no effect on this species due to the absence of critical habitat on the property. During the Fall 2010 surveys, several basins on rock outcrops were

sighted within the study area. Photographs of some of the sighted basins are provided as Photos 27 through 29 in Appendix D. Only one of the basins (Basin 03) contained water (Appendix D Photo 28). The two largest basins were sighted in Area I (Appendix E Figure E-4).

Freshwater marshes and ponds, and to a certain extent, seasonal wetlands within the study area are highly productive wildlife habitats for amphibians, aquatic reptiles, waterfowl, wading birds, and certain songbirds. Many wildlife species depend on the ponds and associated marshes for their entire life cycles; others use them as temporary refuges or migratory stopover areas. The ponds and associated marshes within the study area provide foraging, nesting and resting habitat for ducks, shorebirds, egrets, and herons including the green heron (*Butorides virescens*) (Appendix D Photo 30). These habitats serve as foraging and breeding habitat for various frogs, salamanders, and aquatic reptiles, and also provide prey opportunities for hawks, owls, coyotes, and foxes.

Intermittent streams and associated riparian habitat, such as coast live oak riparian forest, provide valuable habitat for a variety of wildlife species. Wading birds including the great blue heron (*Ardea herodias*), waterfowl including the mallard (*Anas platyrhynchos*), and other birds including the red-winged blackbird (*Agelaius phoeniceus*) utilize the intermittent streams when they are inundated during the wet season. The associated riparian habitats provide foraging habitat and cover for raptors, owls, and a variety of mammal species.

A total of three inactive raptor stick nests were sighted within the study area during the surveys. Although these nests were inactive during the surveys, they could potentially be used by raptors during the nesting season. A fourth nest was suspected to potentially exist on a cliff north of the LOX Site (Appendix E Figure E-4). Although a nest was not seen on the cliff, a pair of red-tailed hawks was regularly sighted in the area and whitewash and prey remains existed at the bottom of the cliff, suggesting the potential presence of a nest somewhere on the cliff (Appendix D Photos 31 and 32). All of the stick nests that were sighted (Stick Nests 01, 02, and 03) existed around the Alfa Site in Area II (Appendix E Figures E-2 and E-3). Stick Nest 01 is a large nest on a man-made structure within the Alfa Site (Appendix D Photos 33 and 34); Stick Nest 02 is on a cliff south of the Alfa Site (Appendix D Photos 35 and 36); and Stick Nest 03 is on a cliff southwest of the Alfa Site (Appendix D Photos 37 and 38).

SECTION 5

Conclusions and Recommendations

5.1 Conclusions

All of the natural and non-natural habitat types that exist on NASA-administered property at SSFL were characterized and mapped during the Fall 2010 surveys. The habitat assessments were not limited by season; therefore, the habitat characterizations and mapping conducted are considered to be accurate and comprehensive. The primary natural habitats on NASA-administered property are baccharis scrub, chaparral, coast live oak riparian forest, coast live oak woodland, freshwater marsh, mulefat scrub, non-native grassland, Venturan coastal sage scrub, southern willow scrub, and undifferentiated wetland. The primary non-natural habitats on NASA-administered property are developed, open water, and ruderal. Chaparral (172.63 acres) is the dominant natural habitat type and developed (58.10) is the dominant non-natural habitat type. Overall, the natural habitats on NASA-administered property have relatively good ecological quality and functionality. The effects of recent fires appeared to be relatively minor and impacts from past site operations appeared mostly limited to habitats near developed areas.

No specimens of the federally Endangered Braunton's milk-vetch were sighted on NASA-administered property during the surveys. This plant species has not been sighted on NASA-administered property at SSFL in the past but was expected to have potentially recruited onto NASA-administered property following recent fires near SSFL. Based on inspections of Braunton's milk-vetch at a known location on Boeing's property during the surveys, the species was in a state of senescence. Although senescent, the species appeared to be readily identifiable; therefore, the species-specific survey conducted is considered reliable.

The Santa Susana tarplant, which is state-listed as Rare, was sighted in 3,657 locations on NASA-administered property during the surveys. This species was in bloom and, therefore, easily identifiable during the surveys. It was primarily found in sandstone outcrop habitat and the majority of the sightings were in Area II.

Dudleya surveys focused on non-chalky species of dudleya because non-chalky specimens could potentially be listed or special-status species. Because the dudleya plants are not in bloom during fall, a comprehensive survey of listed and special-status species of dudleya was not conducted. Non-chalky dudleya plants were sighted in 30 locations, all of which were in Area II. The plants were almost exclusively associated with remnant patches of grasses on north-facing sandstone slopes. The recorded dudleya locations represent areas and habitats where listed and special-status species of dudleya could potentially occur.

The California black walnut is not state or federally listed but is considered vulnerable due to overgrazing and habitat loss. Three individual California black walnut trees were sighted during the surveys. This species is easily identifiable during any season; therefore, the species-specific survey conducted is considered reliable.

Species-specific surveys for listed/special-status animal species were not conducted during the Fall 2010 surveys; however, opportunistic wildlife observations were recorded. A total of 7 herpetile species, 51 bird species, and 10 mammal species were identified during the

surveys. One SSC reptile species (coast horned lizard), one SSC bird species (loggerhead shrike), and one fully protected mammal species (ring-tailed cat) were sighted, and one federally Endangered butterfly species (Quino checkerspot butterfly) was potentially sighted. Several basins on rock outcrops that could potentially support listed fairy shrimp species were found. A total of three inactive raptor stick nests were sighted and a fourth nest was suspected to exist on a cliff based on the presence of whitewash and prey remains at the bottom of the cliff. Although the sighted nests were inactive during the surveys, they could potentially be used by raptors during the nesting season.

5.2 Recommendations

The habitat characterizations and mapping conducted during the Fall 2010 surveys are considered to be accurate and comprehensive; therefore, additional habitat assessments are not recommended for the near term. Additional surveys for listed, special-status, and common plant and animal species are recommended to be conducted during springtime to complement the findings of the Fall 2010 surveys. During fall, most of the annual plants are in a state of senescence and not easily identifiable. Many animal species, including several species of migratory birds, also do not occur in the area during fall. A spring survey would provide a more comprehensive assessment of certain listed/special status plant species as well as a more comprehensive inventory of common plant and animal species on NASA-administered property.

Specifically, a spring dudleya survey is recommended to provide a more comprehensive assessment of listed and special-status species of dudleya on NASA-administered property. During spring, the species and protection status of the dudleya plants found during the Fall 2010 surveys could be determined, and additional focused surveys could be conducted in specific habitats. Focused spring surveys are also recommended for listed fairy shrimp species; species that occur in seasonal drainages and undifferentiated wetlands; and nesting birds, including raptors. The occurrence location for Braunton's milk-vetch shown on the CNDDB map is also recommended to be revisited during spring to confirm the presence or absence of this species in this area. Further assessment of potential Quino checkerspot butterfly occurrence on the property could also be considered for the spring surveys.

SECTION 6

References

CH2M HILL. 2008. *Draft Group 2 RCRA Facility Investigation*, Santa Susana Field Laboratory, Ventura County, California. December.

CH2M HILL. 2009. *Draft Group 3 RCRA Facility Investigation*, Santa Susana Field Laboratory, Ventura County, California. May.

CH2M HILL. 2009s. *Draft Group 9 RCRA Facility Investigation*, Santa Susana Field Laboratory, Ventura County, California. November.

California Department of Fish and Game (CDFG). 2010. California Wildlife Habitat Relationships System. http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp.

California Native Plant Society (CNPS). 2010. On-line Inventory of Rare and Endangered Plants (http://www.rareplants.cnps.org).

California Natural Diversity Database (CNDDB). 2008. Biogeographic Data Branch, California Department of Fish and Game. RareFind3, Version 3.1.1. March Update, Sacramento, CA.

CNDDB. 1990. List of Natural Communities. November.

Holland, Robert. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. State of California Department of Fish and Game.

MWH Americas, Inc. (MWH). 2007. Plant Health Assessment of the Group 8 Chemical Use Areas, Santa Susana Field Laboratory, Ventura County, California (Attachment F-6 of the Human Health and Ecological Risk Assessment, Volume IV, Appendix F of the Group 8 – Western Portion of Area IV RCRA Facility Investigation Report). May.

Miles, S., and C. Goudey (editors). 1998. *Ecological Subregions of California*. United States Department of Agriculture, Forest Service. Pacific Southwest Division. R5-EM-TP-005-Net. San Francisco, California.

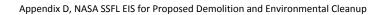
Sawyer, J., T. Keeler-Wolf, and J. Evens. 2009. A Manual of California Vegetation. Second edition. Sacramento, California: California Native Plant Society.

Science Applications International Corporation (SAIC). 2009. Fall Biological Survey Report for Santa Susana Field Laboratory Area IV and Northern Undeveloped Areas. Prepared for CDM and U.S. Department of Energy. November.

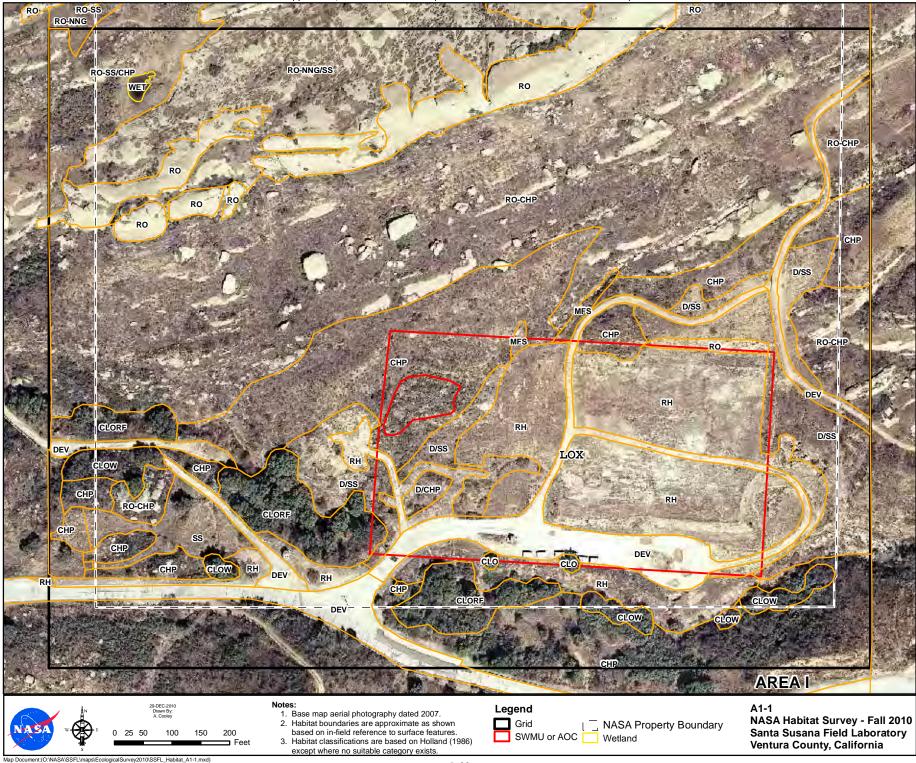
SAIC. 1994. Final RCRA Facility Assessment (RFA) Report. Prepared for Rockwell International Corporation, Rocketdyne Division. Santa Susana Field Laboratory, Venura County, California, Technical Enforcement Support at Hazardous Waste Sites. May.

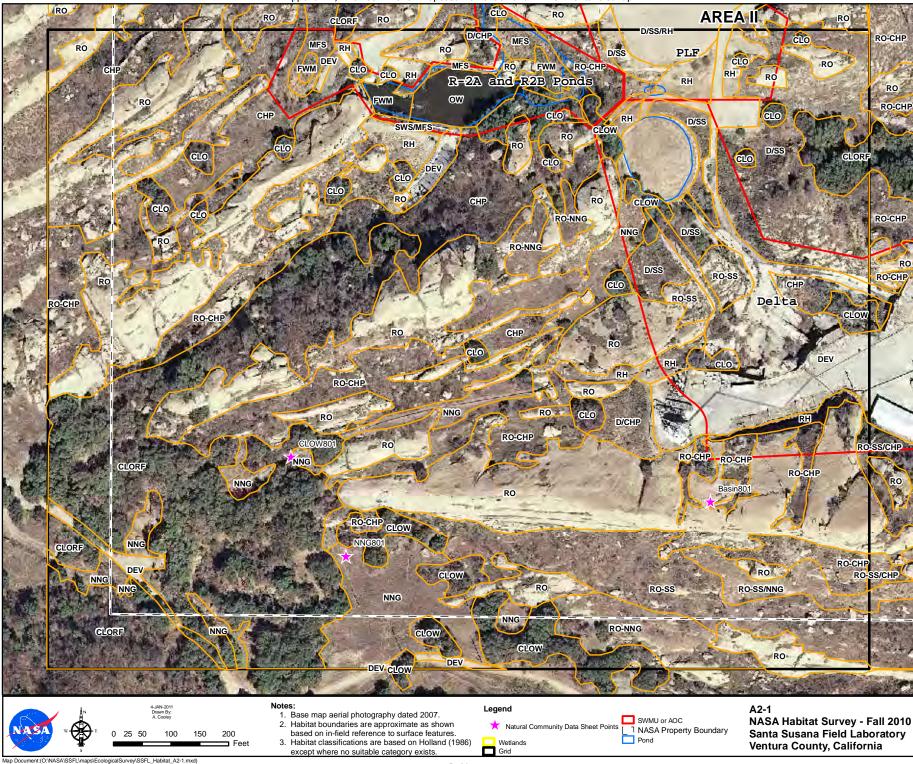
Sonoma Technology, Inc. 2003. Presentation Regarding: Historical Air Pollutants (HAP) Emissions from SSFL: Preliminary Analysis. August 19.

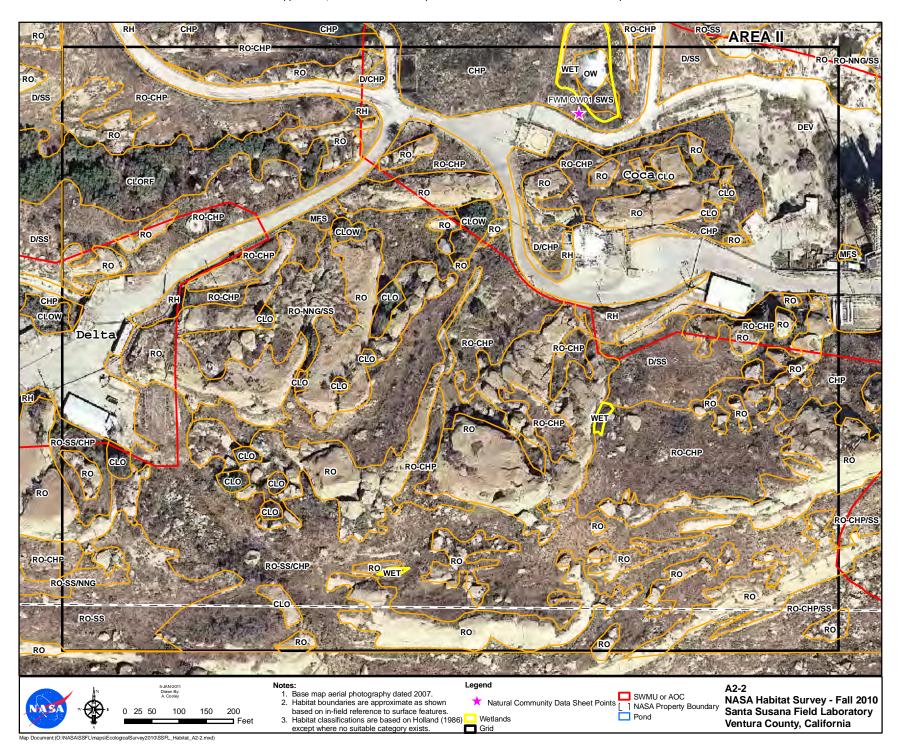
Technology Associates International Corporation (TAIC). 2002. Vegetation Mapping for SSFL, November 15 (metadata).



Appendix D, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup	
	Appendix A
	Habitat Mapping
	Travitat Mapping









4-JAN-2011 Drawn By: A. Cooley

100

200

Base map aerial photography dated 2007.
 Habitat boundaries are approximate as shown based on in-field reference to surface features.
 Habitat classifications are based on Holland (1986)

except where no suitable category exists.

Legend

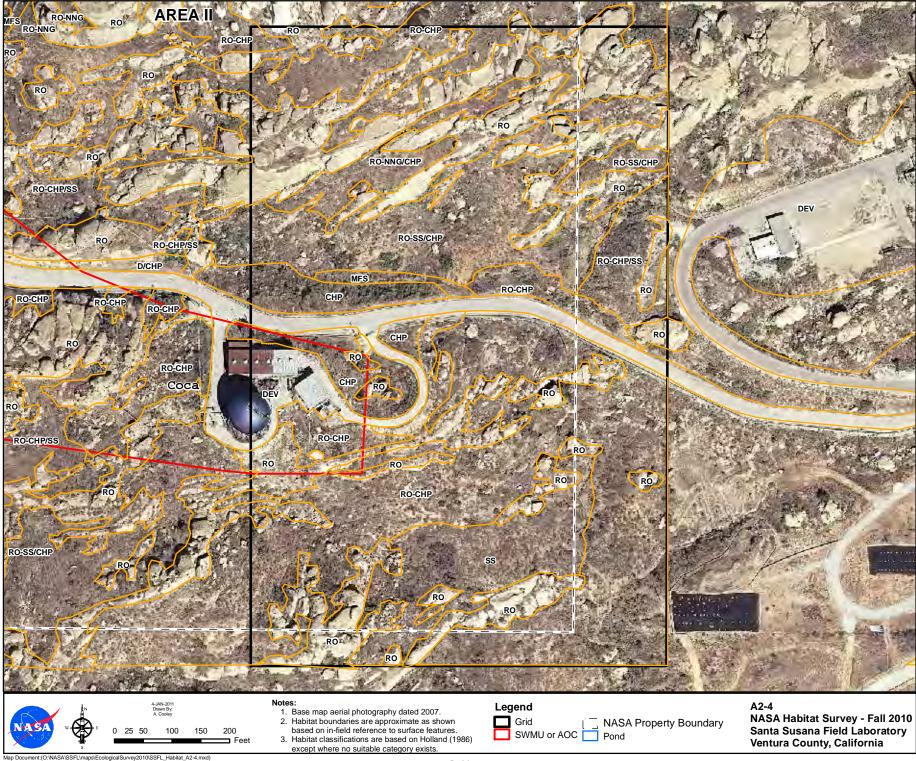
Grid

Grid NASA Property Boundary
SWMU or AOC Pond

A2-3

NASA Habitat Survey - Fall 2010

Santa Susana Field Laboratory Ventura County, California



0 25 50

100

150

200

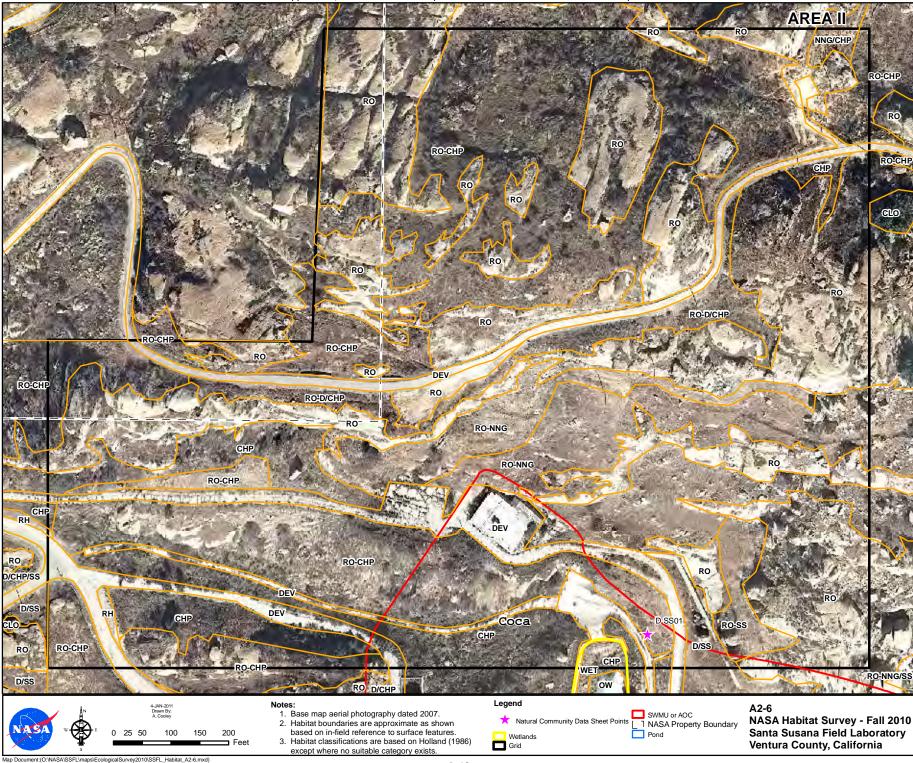
Santa Susana Field Laboratory

Ventura County, California

based on in-field reference to surface features.

except where no suitable category exists.

3. Habitat classifications are based on Holland (1986)



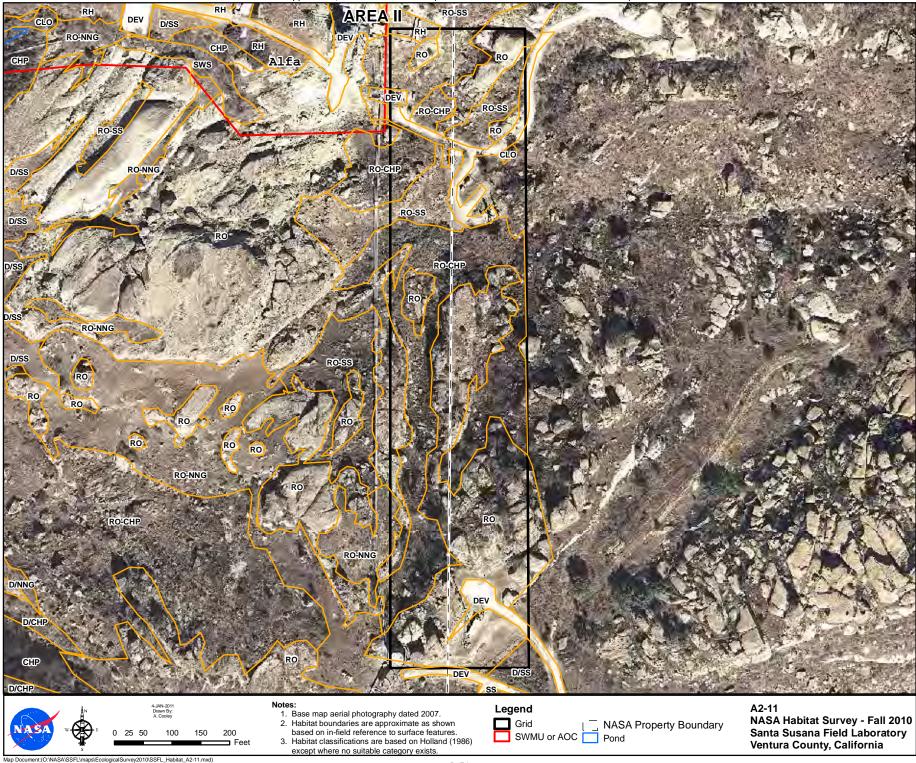


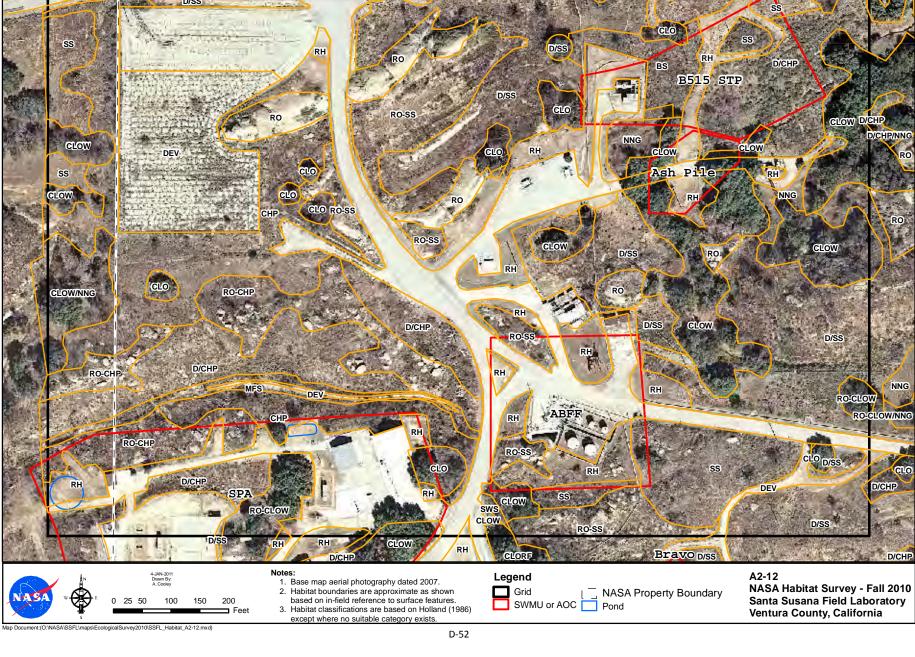
Grid NASA Property Boundary
SWMU or AOC Pond

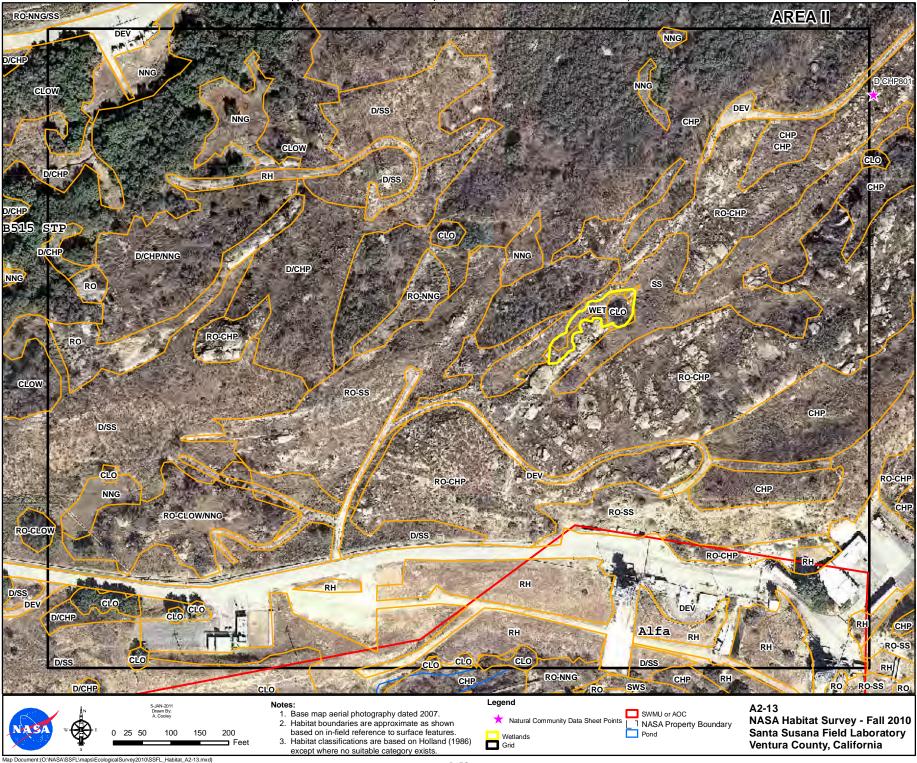
NASA Habitat Survey - Fall 2010

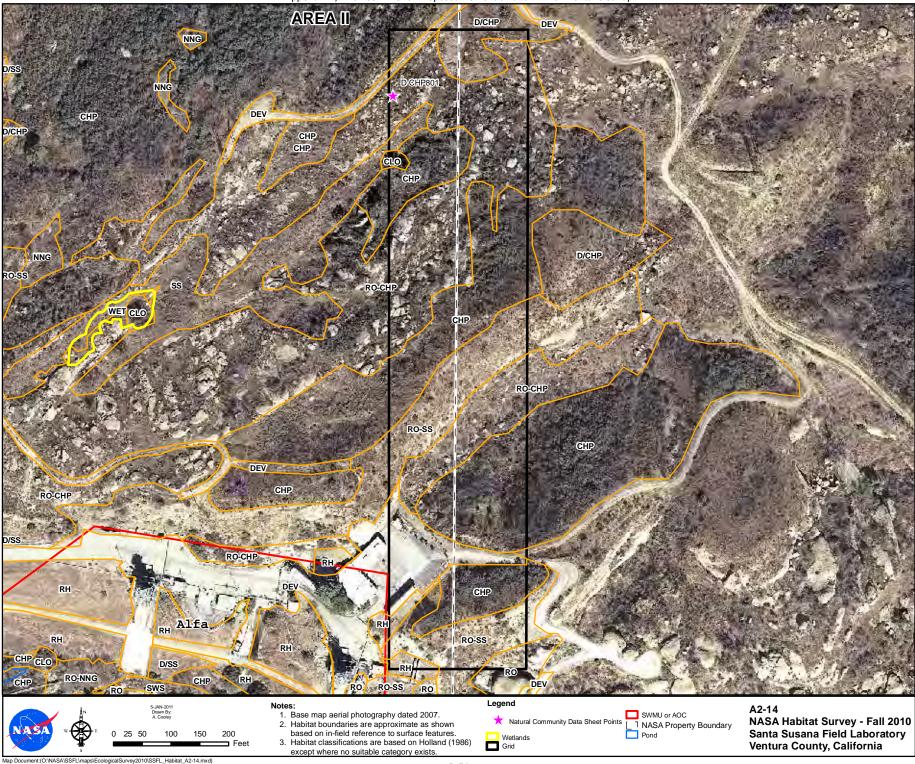
Santa Susana Field Laboratory Ventura County, California

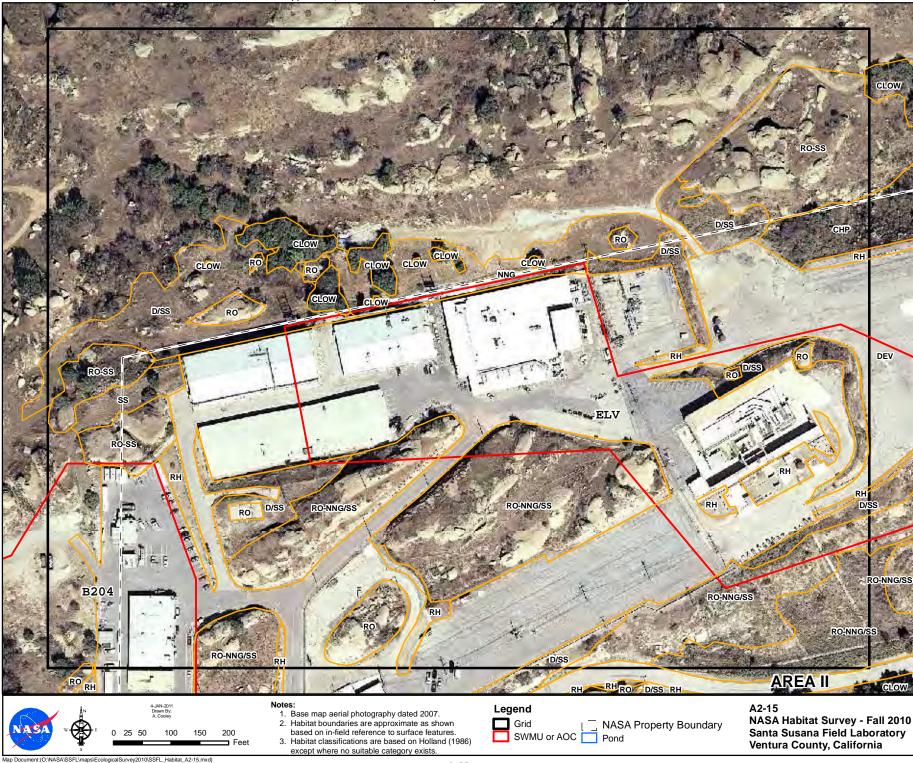
Base map aerial photography dated 2007.
 Habitat boundaries are approximate as shown based on in-field reference to surface features.
 Habitat classifications are based on Holland (1986) except where no suitable category exists.

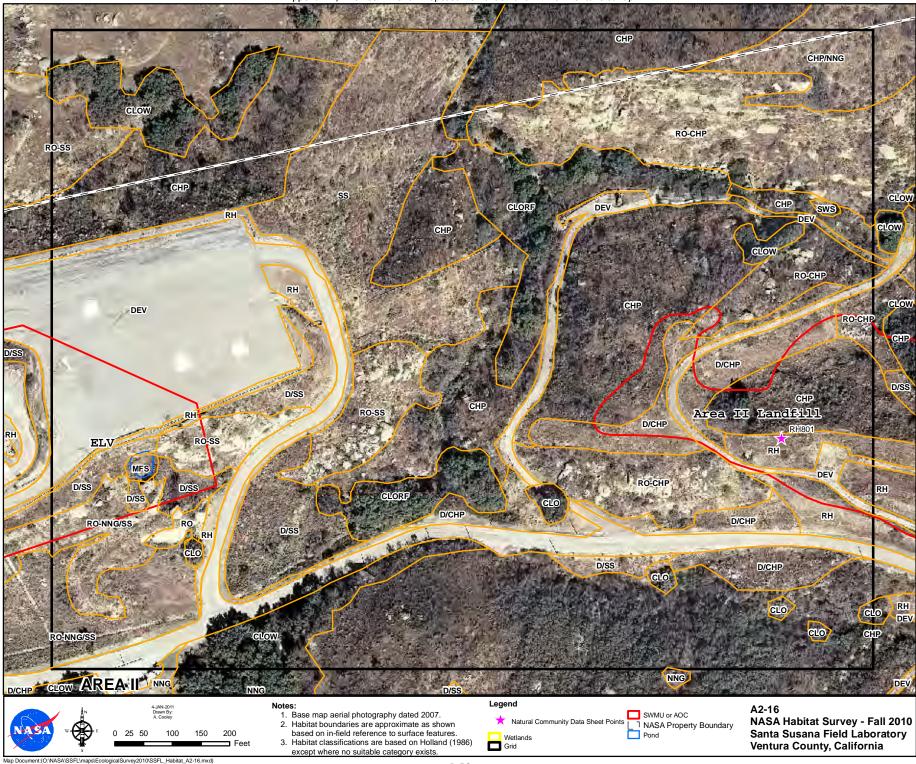














- Base map aerial photography dated 2007.
 Habitat boundaries are approximate as shown
- based on in-field reference to surface features.

 3. Habitat classifications are based on Holland (1986) except where no suitable category exists.



Grid

Grid NASA Property Boundary
SWMU or AOC Pond

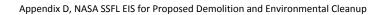
A2-17 NASA Habitat Survey - Fall 2010 Santa Susana Field Laboratory Ventura County, California



This page intentionally left blank.

Appendix D, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Appendix B Natural Community Datasheets



This page intentionally left blank.

<u>ID#:</u> CLOW801 <u>Lat/Long:</u> 34°13'29.4"/118°42'24.9"

<u>Date:</u> 10/08/2010 <u>Investigators:</u> S. Long; G. Santolo

<u>Community Type:</u> Coast Live Oak Woodland <u>Photos:</u> Attached

<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree- *Quercus agrifolia* (coast live oak) / Shrub- *Sambucus mexicana* (blue elderberry), *Toxicodendron diversilobum* (poison oak) / Herb - *Phragmites australis* (common reed grass), *Carduus pycnocephalus* (Italian thistle), *Rosa californica* (wild rose), *Avena* sp. (oat), other grasses (indeterminate)

Habitat Quality: Adjacent to pond in Coca Site

<u>Invasive Species:</u> common reed, Italian thistle

<u>Wildlife Observations:</u> Nuttall's woodpecker (*Picoides nuttallii*), western scrub-jay (*Aphelocoma californica*), mule deer (*Odocoileus hemionus*), small mammal burrows

Notes:



Coast Live Oak Woodland habitat

<u>ID#:</u> D-CHP801 <u>Lat/Long:</u> 34°13'08.8"/118°41'33.4"

<u>Date:</u> 10/08/2010 <u>Investigators:</u> S. Long; G. Santolo

<u>Community Type:</u> Disturbed Chaparral <u>Photos:</u> Attached

<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree - *Quercus agrifolia* (coast live oak; occassional), *Crataegus* sp. (hawthorn), *Ceanothus* sp. (California lilac) / Shrub - *Adenostoma fasciculatum* (chamise), *Ribes malvaceum* (chaparral currant), *Phacelia ramosissima* (branching phacelia), *Eriodictyon crassifolium* (Thickleaf yerba santa), *Yucca whipplei* (yucca), *Salvia mellifera* (black sage) / Herb – *Acmispon glaber* (deer weed), *Eriogonum fasciculatum* (California buckwheat) *Bromus diandrus* (ripgut brome), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: Area had been previously burned in the 2005 fires

Invasive Species: None

<u>Wildlife Observations:</u> Cooper's hawk (*Accipiter cooperii*), bushtit (*Psaltriparus minimus*), California thrasher (*Toxostoma redivivum*), yellow-rumped warbler (*Dendroica coronata*), western scrub-jay (*Aphelocoma californica*), spotted towhee (*Pipilo maculatus*), coyote scat (*Canis latrans*), mule deer trails (*Odocoileus hemionus*), small mammal burrows

Notes: Excellent cover, but no water sources



Disturbed Chaparral habitat

<u>ID#:</u> D-SS01 <u>Lat/Long:</u> 34°13'37.5"/118°42'00.6"

<u>Date:</u> 10/08/2010 <u>Investigators:</u> S. Long; G. Santolo

<u>Community Type:</u> Disturbed Sage Scrub <u>Photos:</u> Attached

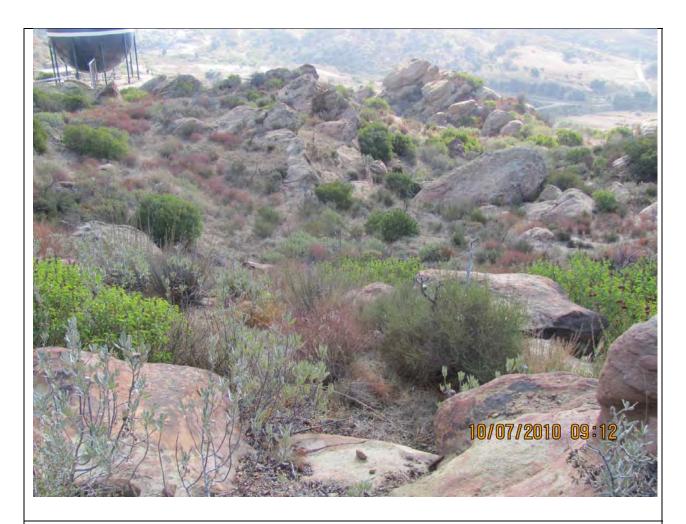
<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree – None / Shrub - Salvia leucophylla (Purple sage), Eriodictyon crassifolium (Thickleaf yerba santa), Baccharis pilularis (coyote brush), Baccharis salicifolia (mulefat) / Herb - Heterotheca grandiflora (telegraph weed), Acmispon glaber (deer weed), Brassica nigra (black mustard)

Habitat Quality: Adjacent to pond in Coca site; previously burned in 2005

Invasive Species: None

<u>Wildlife Observations:</u> Western fence lizard (*Sceloporus occidentalis*), rufous hummingbird (*Selasphorus rufus*), white-throated swifts (*Aeronautes saxatalis*), black phoebe (*Sayornis nigricans*), western scrubjay (*Aphelocoma californica*), California towhee (*Melozone crissalis*), desert cottontail (*Sylvilagus audubonii*), small mammal burrows

Notes: Adjacent to roadways



Disturbed Sage Scrub habitat

<u>ID#:</u> FWM-OW01 <u>Lat/Long:</u> 34°13'35.7"/118°42'01.7"

<u>Date:</u> 10/08/2010 <u>Investigators:</u> S. Long; G. Santolo

Community Type: Freshwater Marsh – Open Water Photos: Attached

<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree - *Salix lasiolepis* (arroyo willow) / Shrub - *Baccharis pilularis* (coyote brush), *Baccharis salicifolia* (mulefat), *Malosma laurina* (laurel sumac) / Herb - *Deinandra minthornii* (Santa Susana tarplant), *Acmispon glaber* (deer weed), *Typha latifolia* (broad-leaved cattail)

Habitat Quality: Relatively diverse vegetation; unknown chemical stressor

Invasive Species: None

<u>Wildlife Observations:</u> Dragonflies (*Odonata* sp.), fish (possibly *Gambusia*), belted kingfisher (*Megaceryle alcyon*), wrentit (*Chamaea fasciata*), yellow-rumped warbler (*Dendroica coronata*), spotted towhee (*Pipilo maculatus*), American goldfinch (*Spinus tristis*)

<u>Notes:</u> Aeration spray device (possibly to address VOCs in runoff); concrete reinforced construction with soil accumulations



Freshwater Marsh-Open Water habitat

<u>ID#:</u> RO-NNG <u>Lat/Long:</u> 34°13′52.3″/118°41′36.7″

<u>Date:</u> 10/01/2010 <u>Investigators:</u> S. Long; G. Santolo

<u>Community Type:</u> Rock Outcrop – Non-native Grassland <u>Photos:</u> Attached

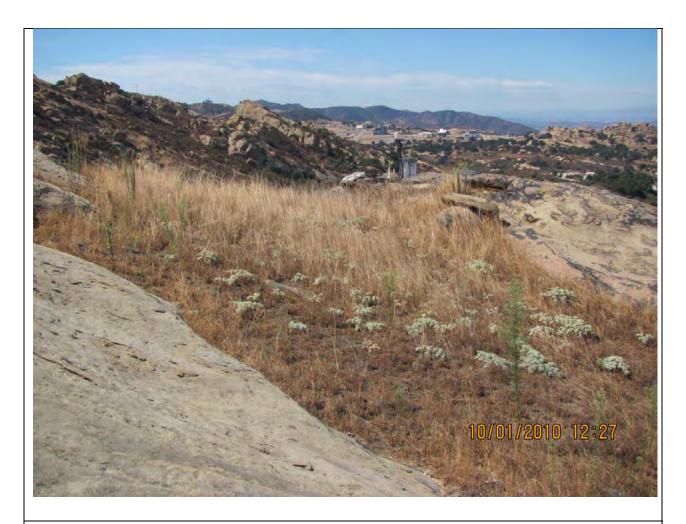
<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree – None / Shrub – None / Herb - *Avena fatua* (oat), *Eremocarpus setigerus* (doveweed), *Conyza canadensis* (Canadian horseweed), *Brassica nigra* (black mustard), *Bromus diandrus* (ripgut brome), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: Relatively undisturbed

Invasive Species: Canadian horseweed

<u>Wildlife Observations:</u> Possible raptor stick nest in this area, mule deer, vole runways, grazed plants, and woodrat scat.

Notes:



Rock Outcrop – Non-native Grassland habitat

<u>ID#:</u> RH801 <u>Lat/Long:</u> 34°13′13.9″/118°42′35.4″

<u>Date:</u> 10/08/2010 <u>Investigators:</u> S. Long; G. Santolo

Community Type: Ruderal Photos: Attached

<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree – None / Shrub - *Phacelia ramosissima* (branching phacelia), *Centaurea melitensis* (tocalote), *Artemisia californica* (California sagebrush), *Symphyotrichum* or *Dieteria* (purple aster)? *Salvia apiana* (white sage), *Baccharis pilularis* (coyote brush) / Herb - *Carduus pycnocephalus* (Italian thistle), *Cirsium occidentale* (cobweb thistle), *Rumex crispus* (curly dock), *Brassica nigra* (black mustard), *Acmispon glaber* (deer weed), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: moderately disturbed

Invasive Species: Italian thistle

<u>Wildlife Observations:</u> Western fence lizard (*Sceloporus occidentalis*), coast horned lizard (*Phrynosoma coronatum* [=*Phrynosoma blainvillii*]), California thrasher (*Toxostoma redivivum*), western scrub-jay (*Aphelocoma californica*), mule deer (*Odocoileus hemionus*), small mammal burrows

<u>Notes:</u> Possible limited fire damage. Most trees not burned but several large old dead trees within rock; scorched trunks.



Ruderal habitat

<u>ID#:</u> NNG801 <u>Lat/Long:</u> 34°13′27.7″/118°42′23.7″

Date: 10/08/2010 Investigators: S. Long; G. Santolo

Community Type: Non-native Grassland southeast corner Photos: Attached

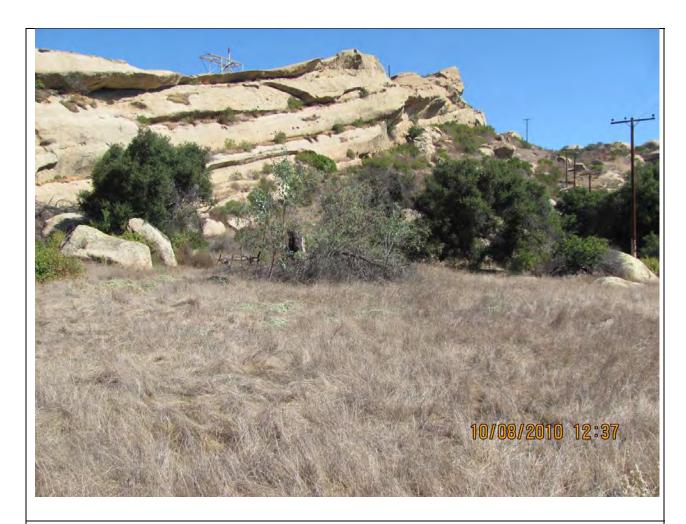
<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree - *Quercus agrifolia* (coast live oak) / Shrub - *Toxicodendron diversilobum* (poison oak), *Phacelia ramosissima* (branching phacelia) / Herb - *Avena* sp. (oat), *Bromus diandrus* (ripgut brome), *Eremocarpus setigerus* (doveweed), *Centaurea melitensis* (tocalote), *Centaurea solstitialis* (yellow star thistle)

Habitat Quality: Previously burned in 2005

Invasive Species: yellow star thistle

<u>Wildlife Observations:</u> Acorn woodpecker (*Melanerpes formicivorus*), black-chinned hummingbird (*Archilochus alexandri*), wrentit (*Chamaea fasciata*), western scrub-jay (*Aphelocoma californica*), coyote scat (*Canis* latrans), gopher burrows (*Thomomys bottae*), mule deer (*Odocoileus hemionus*), small mammal burrows

<u>Notes:</u> Possible limited fire damage. Most trees not burned but several large old dead trees within rock; scorched trunks.



Non-native Grassland habitat

NASA Santa Susana Field Laboratory Natural Community Datasheet

<u>ID#:</u> RO-NE corner <u>Lat/Long:</u> 34°14′26.5″/118°41′07.0″

<u>Date:</u> 9/28/2010 <u>Investigators:</u> S. Long; G. Santolo

Community Type: Rock Outcrop Photos: Attached

<u>Dominant Vegetation (Stratum: T/S/H):</u> Tree – None / Shrub – None / Herb - *Malosma laurina* (laurel sumac), *Brassica* sp. (mustard), *Deinandra minthornii* (Santa Susana tarplant), *Avena fatua* (wild oat), *Bromus madritensis* ssp. *rubens* (red brome)

<u>Habitat Quality:</u> Relatively undisturbed except for foot trails. Depauperate rock outcrop with sand seams and accumulations where plants take hold.

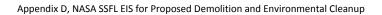
Invasive Species: None

Wildlife Observations: Western fence lizard (Sceloporus occidentalis)

Notes: Elevation ~600 feet



Rock Outcrop with sand seams and accumulations where Santa Susana tarplants take root.



Appendix C Plant List

APPENDIX C
Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

		Group 2 Sites					Group 3 Sites						Group 9 Sites		
Common Name	Scientific Name	LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	wct	R2 Ponds	CDFF	
Agave (ornamental)	Agave sp.						Х								
Arroyo willow	Salix lasiolepis												Х		
Black mustard	Brassica nigra	Х	Х		Х										
Black sage	Salvia mellifera	Х		Х	Х	Х				Х		Х			
Blue dick	Dichelostemma capitatum				Х		Х	Х	Х			х			
Blue elderberry	Sambucus mexicana (S. nigra subsp. caerulea)												х	х	
Branching phacelia	Phacelia ramosissima	Х		Х			Х	Х	Х	Х	Х	Х	Х	Х	
Broad-leaved cattail	Typha latifolia												Х		
California buckwheat	Eriogonum fasciculatum						Х	Х			Х	Х			
California burclover	Medicago polymorpha						Х		Х	Х					
California dodder	Cuscuta californica					Х	Х		Х			Х		Х	
California everlasting	Gnaphalium californicum			Х			Х	Х			Х			Х	
California poppy	Escholzia californica						Х								
California or coastal sagebrush	Artemisia californica	х	х	х	Х	Х			х	Х	х	х		Х	
Canadian horseweed	Conzya canadensis	Х				Х		Х							
Canyon sunflower	Venegasia carpesoides							Х	Х				Х		
Chalk live-forever	Dudleya pulverulenta										Х		Х	Х	

APPENDIX C
Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
Common Name		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
Chamise	Adenostoma fasciculatum	х	х				Х	Х	х	Х	х	х	Х	х
Chaparral currant	Ribes malvaceum						Х					Х		Х
Chaparral yucca	Yucca whipplei	Х							Х		Х	Х	Х	Х
Chia sage, Chia	Salvia columbariae							Х						
Chilcothe, wild cucumber	Marah macrocarpus	х	Х	х	Х			Х		х		Х		
Coast live oak	Quercus agrifolia	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х		Х	Х
Cobweb thistle	Cirsium occidentale			Х				Х	Х	Х			Х	Х
Common Fiddleneck	Amsinckia menzesii var. intermedia	х	х			Х	Х	Х		Х			Х	
Common ice plant	Mesembryanthemum crystallinum						Х	Х						
Common reed	Phragmites australis			Х			Χ			Х				
Coulter pine (ornamental)	Pinus coulteri						Х							
Coyote brush	Baccharis pilularis	Х		Х	Х	Х		Х	Х	Х		Х	Х	Х
Crimson fountaingrass	Pennisetum setaceum			х			Х	Х	Х		Х			
Curly dock	Rumex crispus									Х			Х	
Deer weed	Acmispon glaber		Х	Х	Х		Х	Х	Х	Х		Х	Х	Х
Ceanothus	Ceanothus sp.						Х						Х	Х
Fremont's cottonwood	Populus fremontii												Х	

APPENDIX C
Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

	Scientific Name	Group 2 Sites							Group 3	Sites			Group 9 Sites		
Common Name		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	wct	R2 Ponds	CDFF	
Fringed Indian pink	Silene lacinata								Х						
Golden yarrow	Eriophyllum confertiflorum												Х	х	
Hoary-leaf ceanothus	Ceanothus crassifolius	Х	Х	Х				Х				Х			
Holly-leaved cherry	Prunus ilicifolia	Х													
Holly-leaved redberry	Rhamnus ilicifolia												Х	Х	
Honeysuckle	Lonicera sp.						Х								
Italian thistle	Carduus pycnocephalus			Х											
Laurel sumac	Malosma laurina	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	
Leafy daisy, fleabane	Erigeron foliosus												Х		
Lotus	Lotus hamatus			Х				Х			Х				
Manzanita	Arctostaphylos sp.			Х				Х							
Mexican fan palm	Washingtonia robusta								Х				Х		
Milk thistle	Silybum marianum		Х	Х	Х	Х	Х	Х	Х	Х	Х			Х	
Mugwort	Artemisia douglasiana								Х	Х			Х	Х	
Mulefat	Baccharis salicifolia	Х				Х	Х	Х		Х	Х	Х	Х	Х	
Narrow-leaved milkweed	Asclepias fascicularis												Х	Х	
Narrow-leaved willow	Salix exigua						Х								
Peach (ornamental)	Prunus sp.						Х								

APPENDIX C
Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites		
Common Name		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	wct	R2 Ponds	CDFF	
Perennial ryegrass	Lolium perenne									Х					
Peruvian pepper tree	Schinus molle	х													
Pitcher sage, hummingbird sage	Salvia spathacea									Х					
Poison oak	Toxicodendron diversilobum	Х		х	Х	х		Х	Х	х			Х	Х	
Popcorn flower	Plagiobothrys spp.					Х	Х	Х	Х	Х	Х	Х			
Prickly lettuce	Lactuca serriola						Х	Х							
Prickly sow thistle	Sonchus asper spp. asper		х				Х			Х	х			Х	
Purple needlegrass	Nassella pulchra			Х	Х		Х						Х		
Purple nightshade	Solanum xanti	Х	Х	Х		Х			Х	Х		Х		Х	
Purple sage	Salvia leucophylla					Х	Х	Х			Х	Х			
Rabbitsfoot grass, annual beard grass	Polypogon monspeliensis									Х			Х	Х	
Red brome	Bromus madritensis ssp. rubens	Х	х	х	х	х	Х	Х	Х	х	Х	Х	Х	Х	
Red willow	Salix laevigata						Х	Х	Х	Х			Х	Х	
Red-stem filaree	Erodium cicutarium	Х	Х		Х	Х		Х	Х	Х	Х		Х	Х	
Ripgut brome	Bromus diandrus	Х		Х	Х	Х	Х	Х	Х	Х	Х		Х	Х	
Rock cress	Arabis sparsiflora var. californica												Х		

APPENDIX C
Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

		Group 2 Sites					Group 3 Sites						Group 9 Sites		
Common Name	Scientific Name	LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	wct	R2 Ponds	CDFF	
Salt cedar	Tamarix chinensis			Х											
Santa Susana tarplant	Deinandra minthornii	х	Х	х	Х	х	Х	Х	х	Х	х	х	Х	х	
Scarlet pimpernel	Anagallis arvensis											Х			
Shortpod mustard	Hirschfeldia incana	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	
Silver carpet, California aster	Lessingia filagnifolia	х	х				Х	Х		х			Х		
Slender wild oats	Avena barbata		Х	Х	Х		Х	Х	Х		Х				
Smilo grass	Piptatherum miliaceum												Х		
Soap plant, Amole	Chlorogalum pomeridianum						Х								
Soft chess	Bromus hordeaceus	Х							Х			Х	Х		
Sticky monkeyflower	Mimulus longiflorus			Х				Х		Х	Х		Х	Х	
Stinging lupine	Lupinus hirsutissimus							Х							
Sweet fennel	Foeniculum vulgare												Х		
Telegraph weed	Heterotheca grandiflora			Х		Х	Х	Х	Х	Х					
Thickleaf yerba santa	Eriodictyon crassifolium	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	
Tocalote, yellow star thistle	Centaurea melitensis			х			Х		Х	Х	х	Х	Х	Х	
Tree tobacco	Nicotiana glauca			Х			Х	Х			Х		Х	Х	
Tree-of-heaven	Ailanthus altissima									Х					

APPENDIX C
Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

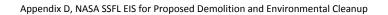
	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
Common Name		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	wct	R2 Ponds	CDFF
White sage	Salvia apiana												Х	
White snapdragon	Antirrhinum coulterianum												Х	
Wild barley	Hordeum murinum						Х						Х	Х
Wild morning glory	Calystegia macrostegia						Х		Х			Х		
Wild oats	Avena fatua												Х	Х
Wild peony	Paeonia californica								Х	Х				
Winter vetch	Vicia villosa		Х	Х	Х	Х				Х	Х		Х	Х
Yellow sweetclover	Melilotus indica	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х

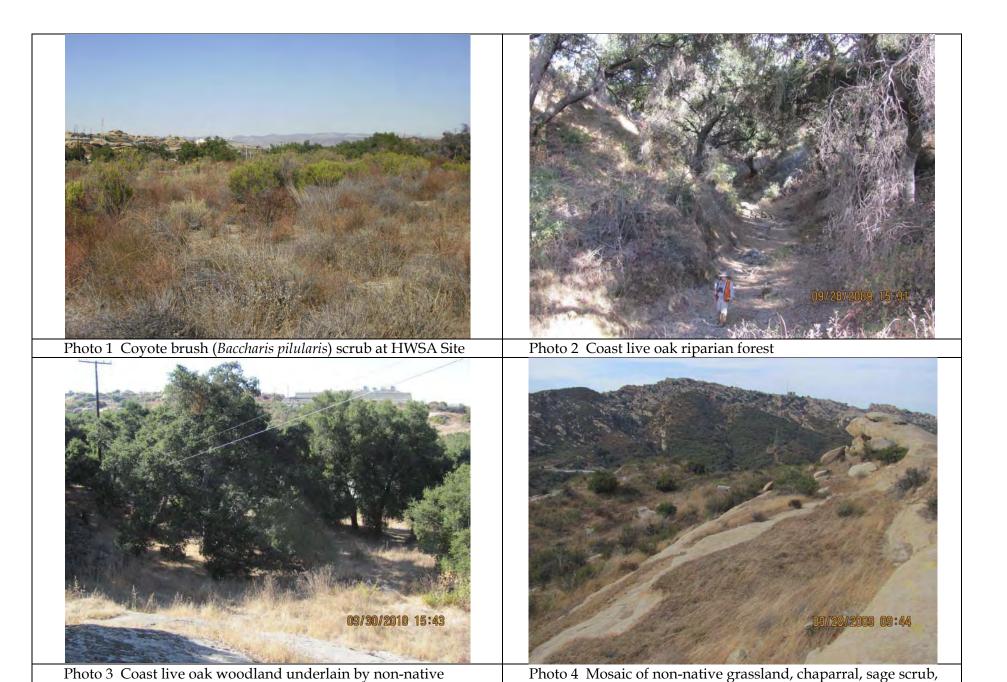
Notes:

- 1. Group 2 and 3 sites were surveyed in April 2008; Group 3 sites were surveyed in May 2009.
- 2. Plants in boldface were sighted during the Fall 2010 survey only.
- 3. Non-chalky species of *Dudleya* were sighted outside RFI areas during the Fall 2010 survey (not listed in table).

Ap Survey Pho	pendix D tographs
	2.20-11-110

Appendix D, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup





and rock outcrop

grassland

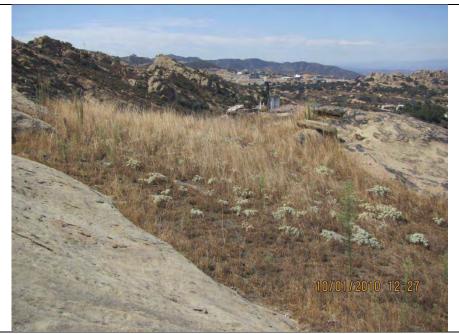




Photo 5 Non-native grassland with dove weed and telegraph weed

Photo 6 Non-native grassland (eroded) on rock outcrop slope



Photo 7 Non-native grassland adjacent to coast live oak woodland



Photo 8 Disturbed (previously burned) sage scrub near Coca Site pond



Photo 9 Sage scrub southeast of Coca Site

Photo 11 Southern willow scrub south of Alfa Site along base of rock slope

Photo 10 Mosaic of chaparral, sage scrub, and rock outcrop



Photo 12 Southern willow scrub adjacent to Coca Site pond

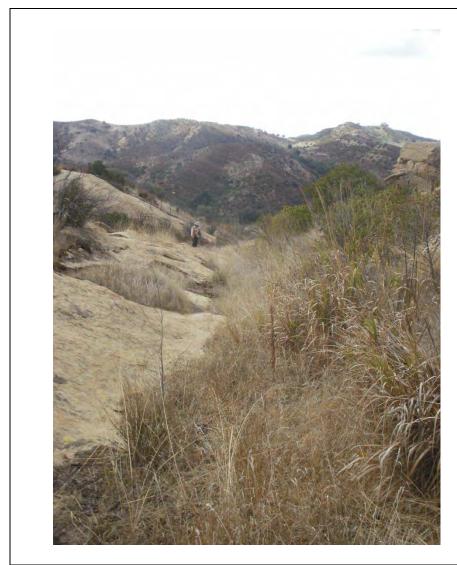


Photo 13 Undifferentiated wetland dominated by common reed

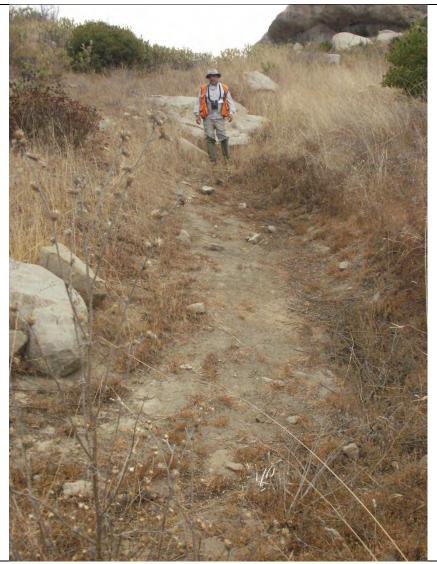


Photo 14 Wetland basin with cocklebur (*Xanthium* sp.) in foreground

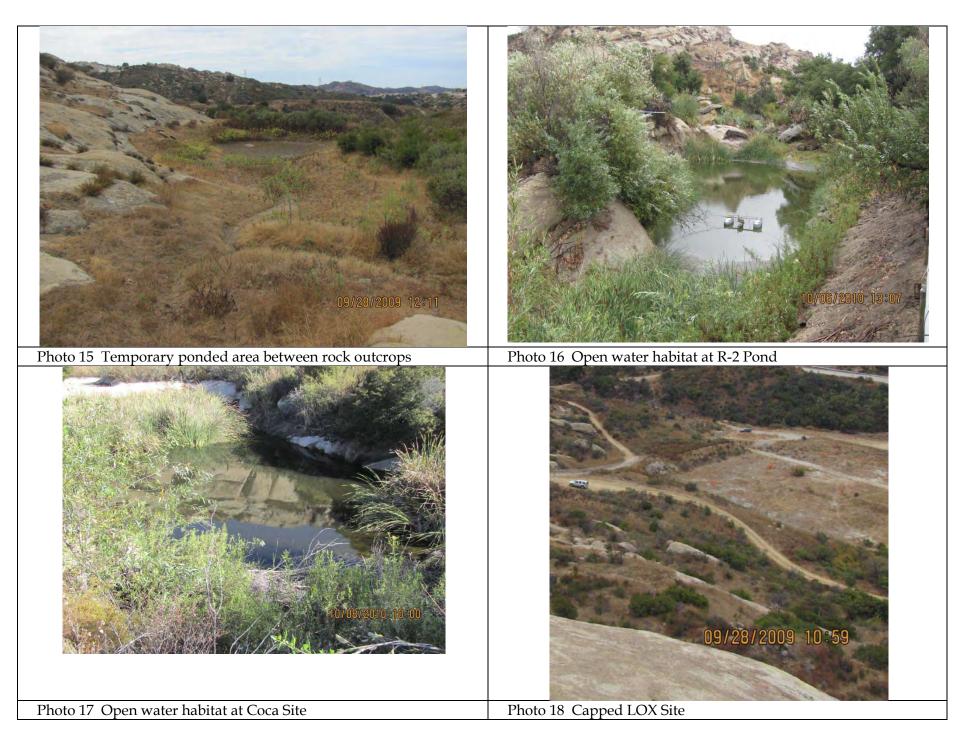




Photo 19 Appearance of Braunton's milk-vetch at time of surveys



Photo 20 Appearance of Santa Susana tarplant at time of surveys



Photo 21 Non-chalky Dudleya lanceolata



Photo 22 Chalky Dudleya pulverulenta



Photo 23 Typical north-facing rock slope habitat where *Dudleya* sp. was found



Photo 25 Mule deer buck rub in Area II



Photo 24 Eroded grassland rock slope habitat where *Dudleya* sp. was found



Photo 26 Western rattlesnake in Area II





Photo 27 Basin 01

Photo 28 Basin 03 (contains water)

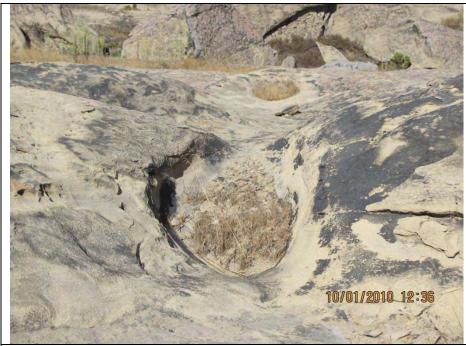




Photo 29 Series of rock basins

9/28/2009 13:09

Photo 31 Possible raptor cliff nest north of LOX Site in Area I



Photo 32 Whitewash and prey remains below possible raptor cliff nest



Photo 33 Stick Nest 01 on structure in Alfa Site



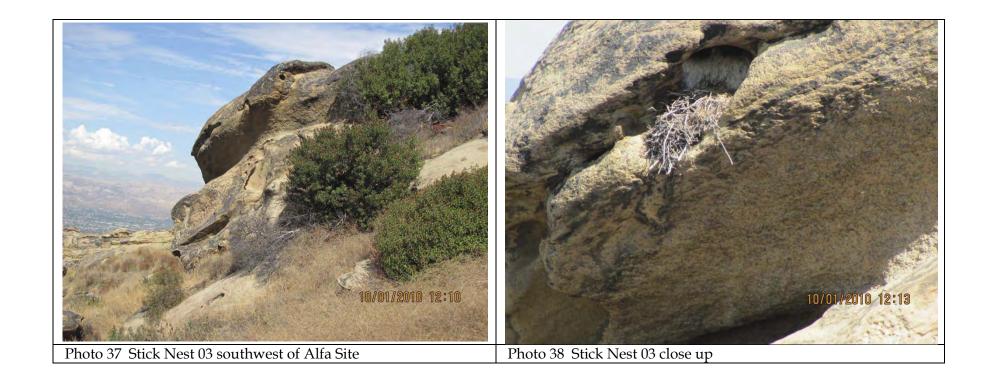
Photo 35 Stick Nest 02 on cliff south of Alfa Site



Photo 34 Stick Nest 01 close up



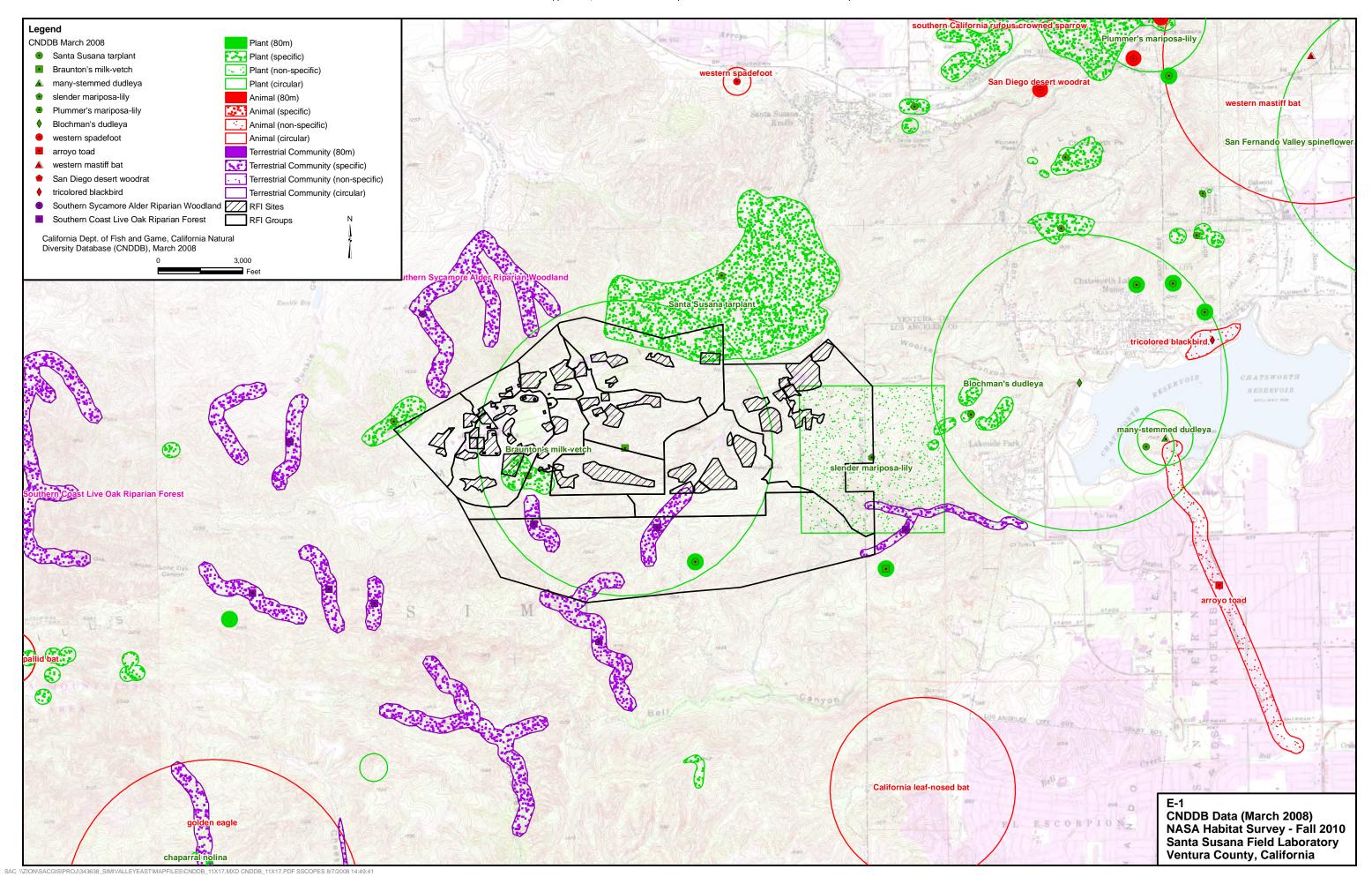
Photo 36 Stick Nest 02 close up

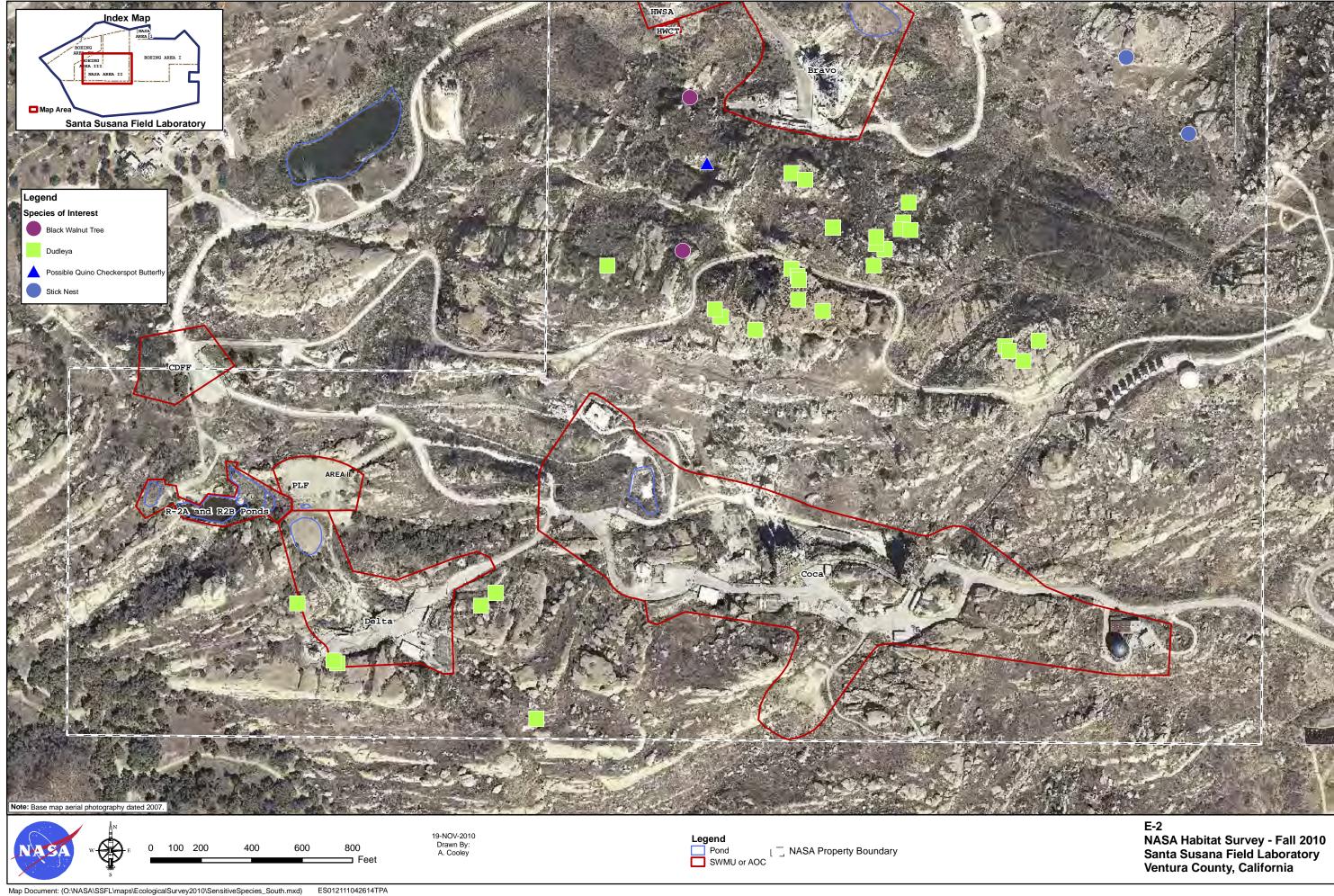




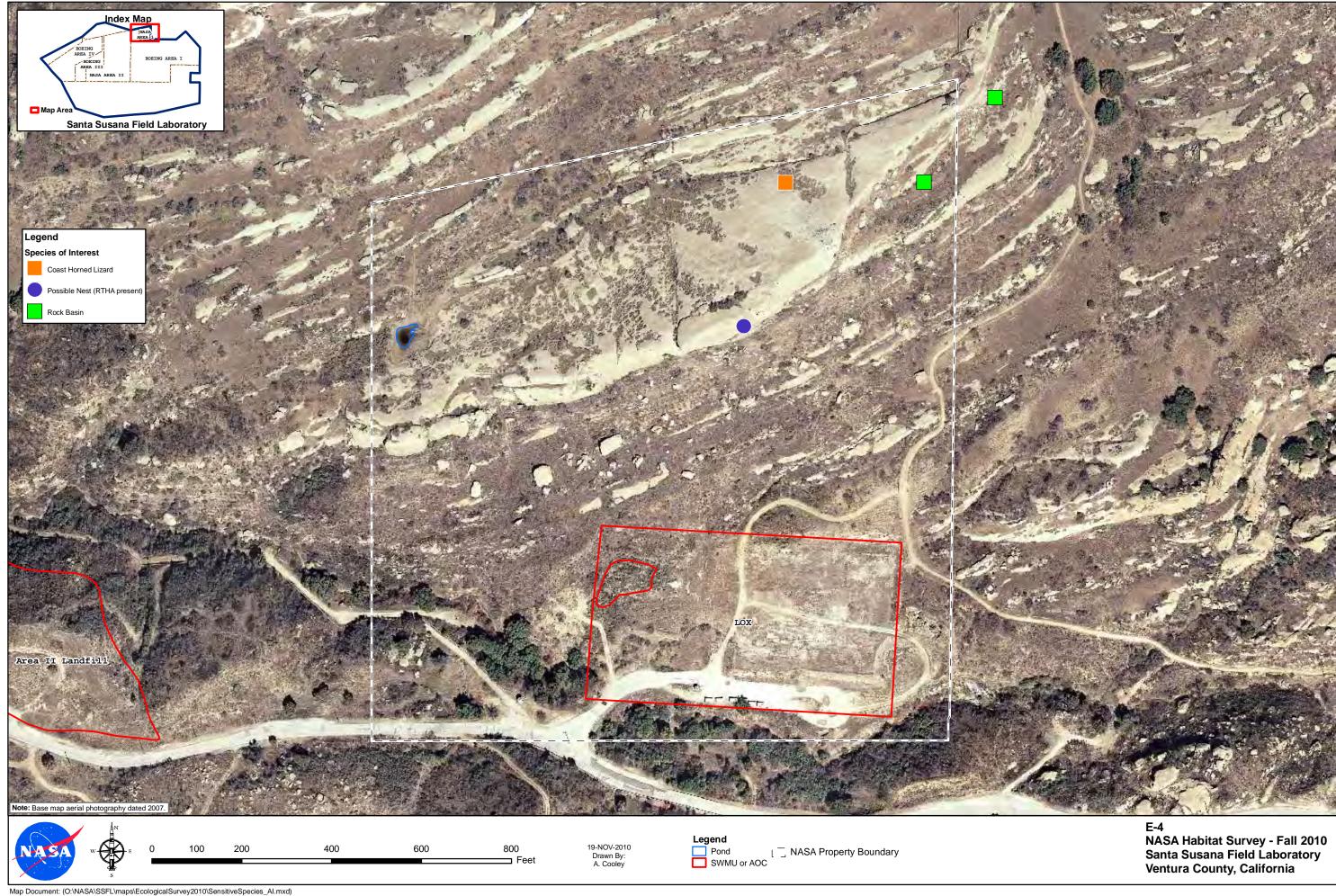
Appendix E Species of Interest Mapping	

Appendix D, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

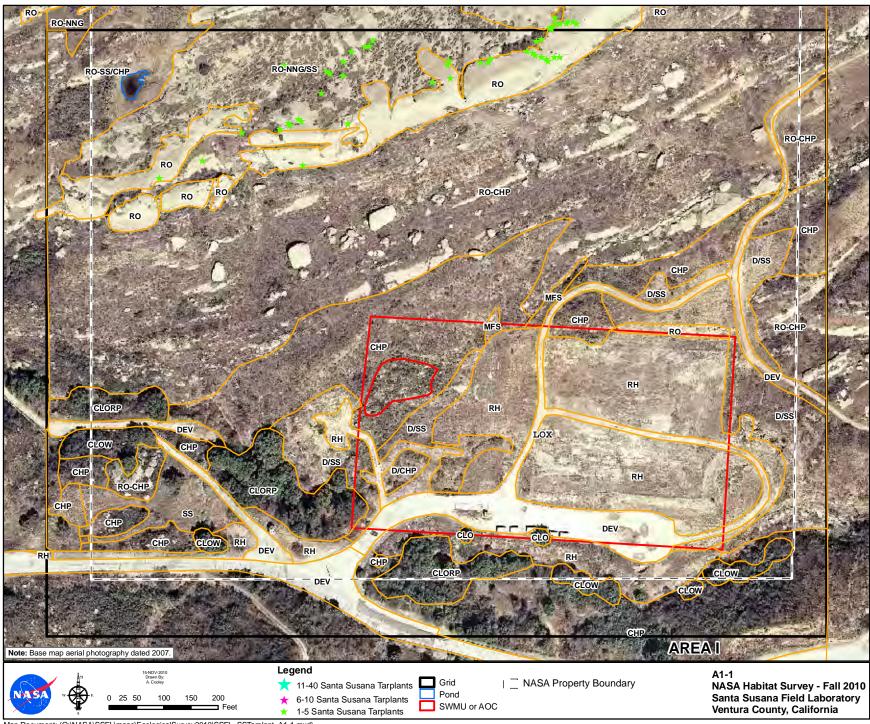




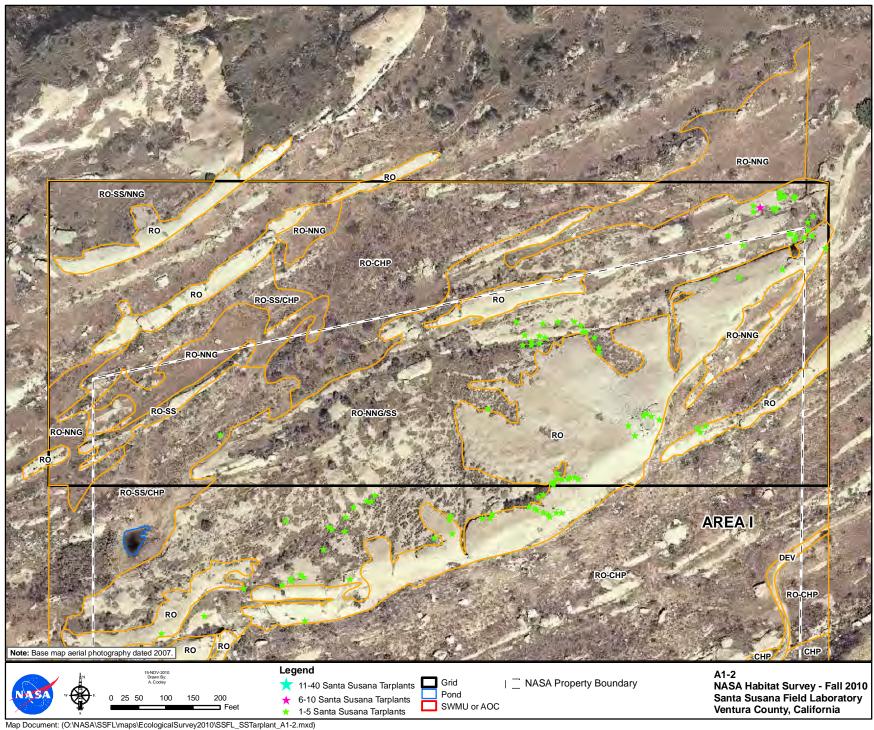


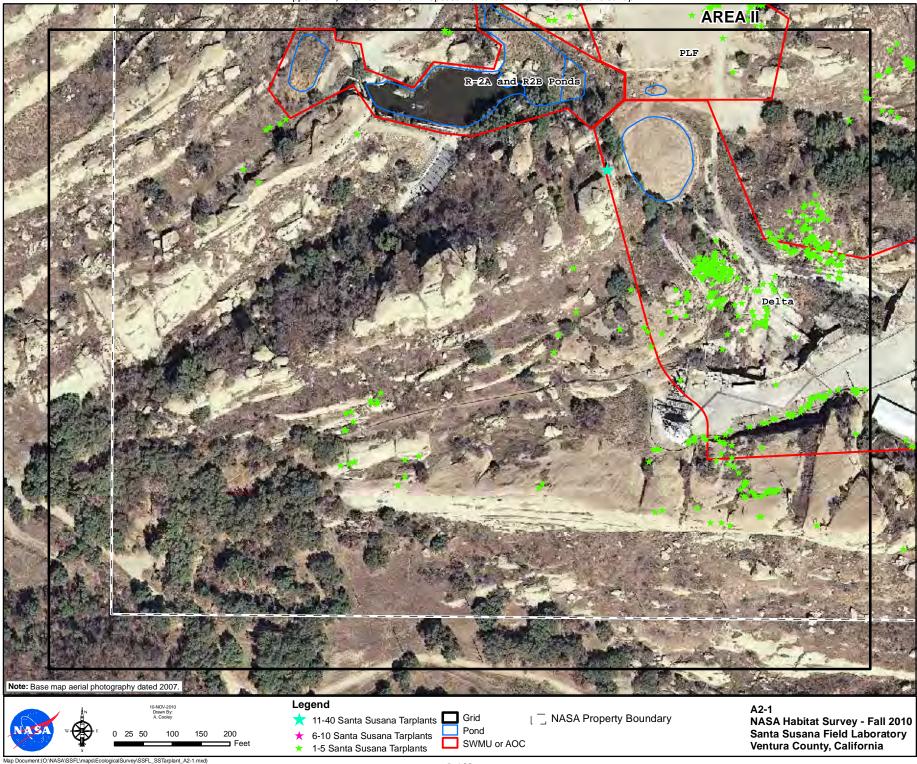


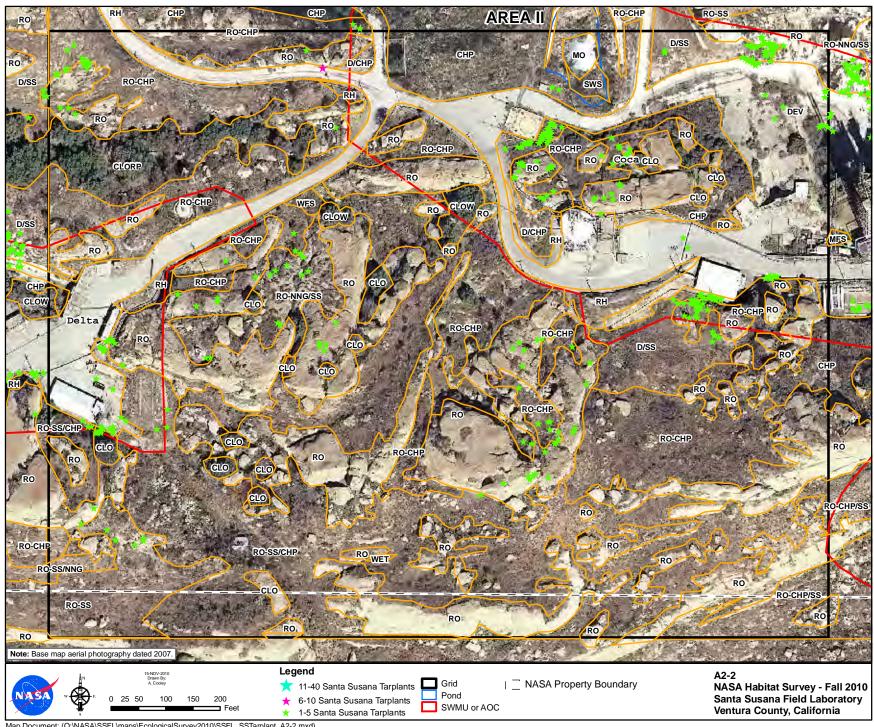
Арре	ndix D, NASA SSFL EIS for Propose	d Demolition and Environmenta	l Cleanup
			Annondiv I
	_	_	Appendix I
	Santa	Susana Tar _l	plant Mapping
	_	-	



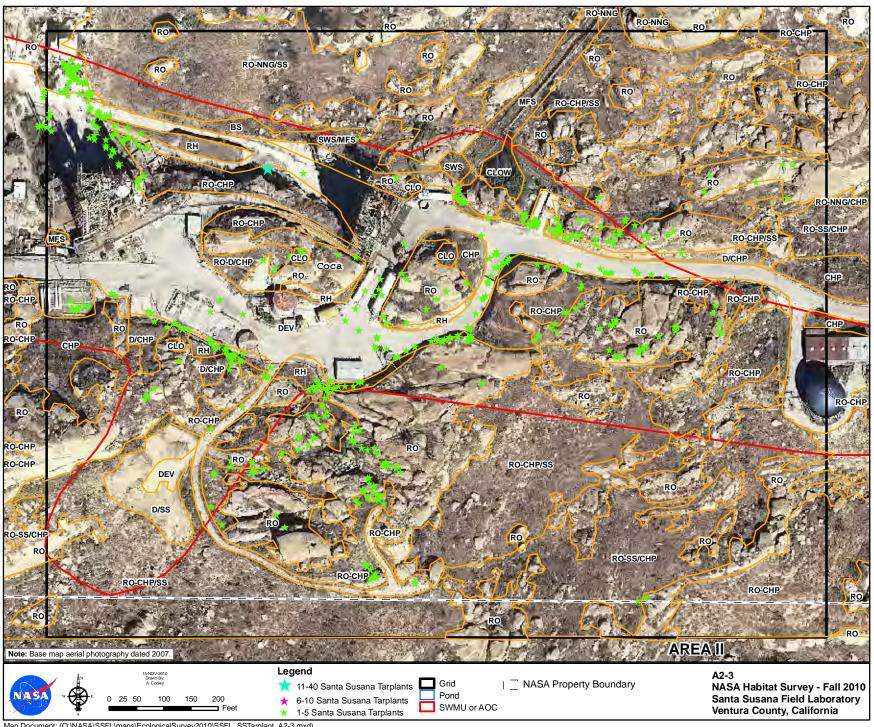
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A1-1.mxd)



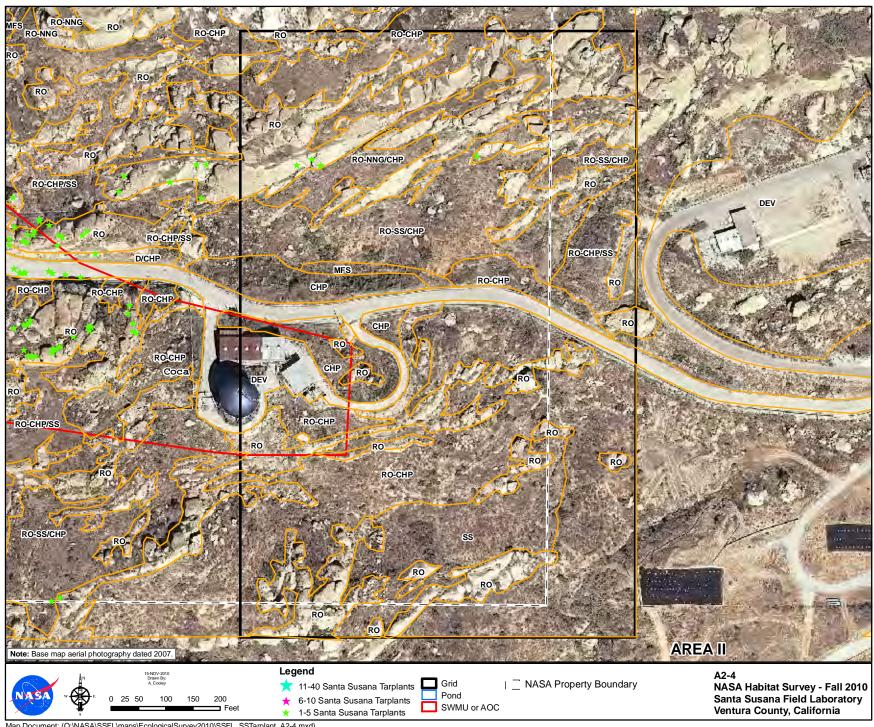




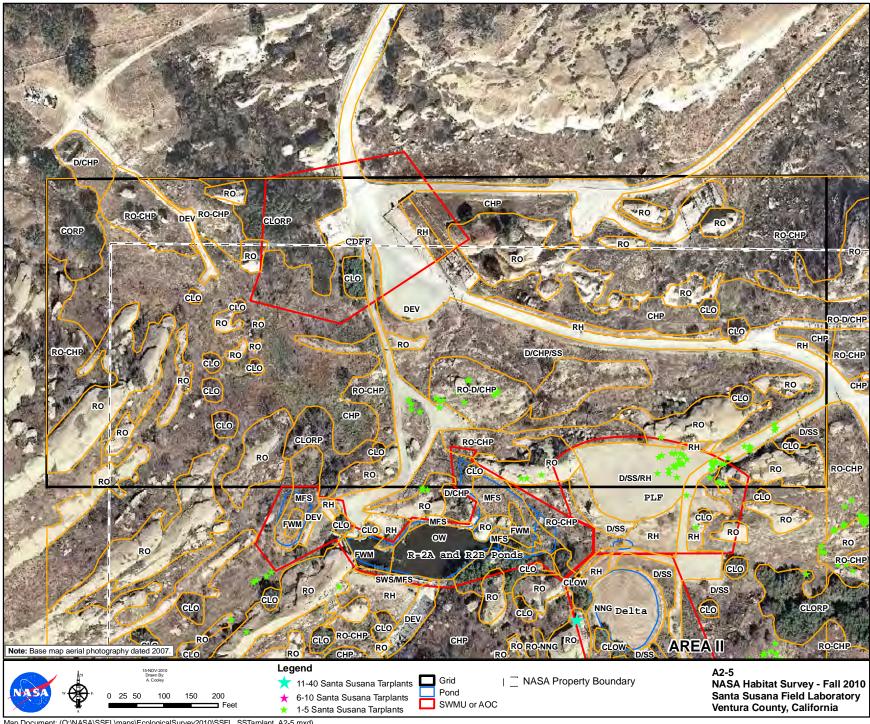
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-2.mxd)



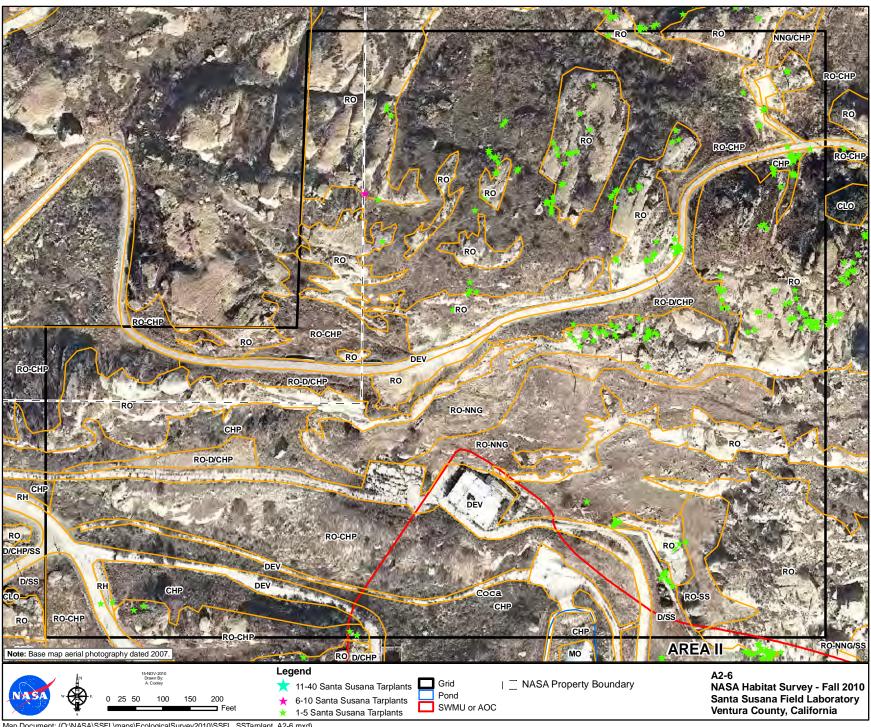
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-3.mxd)



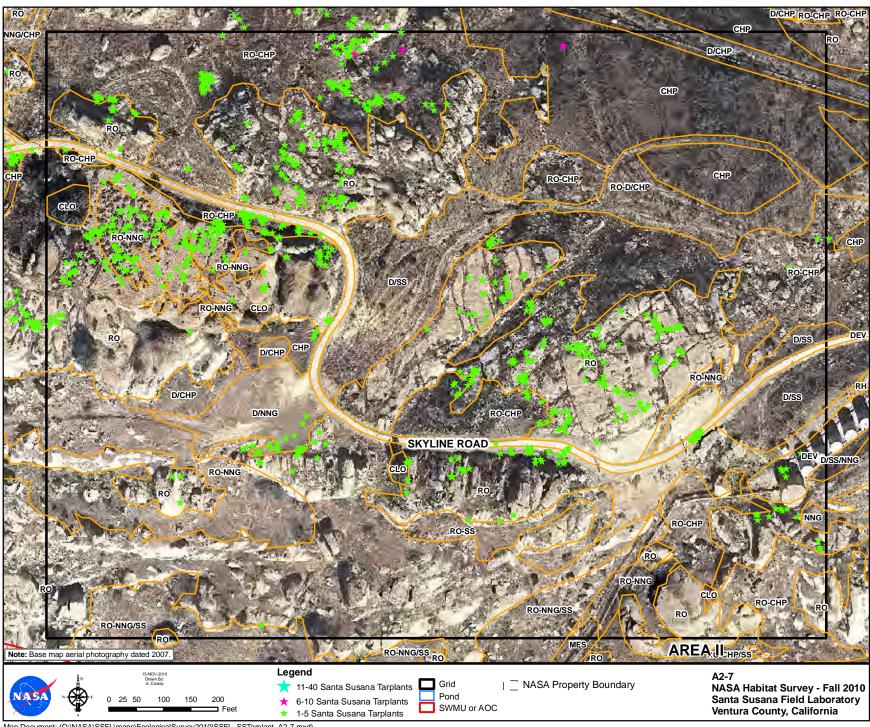
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-4.mxd)



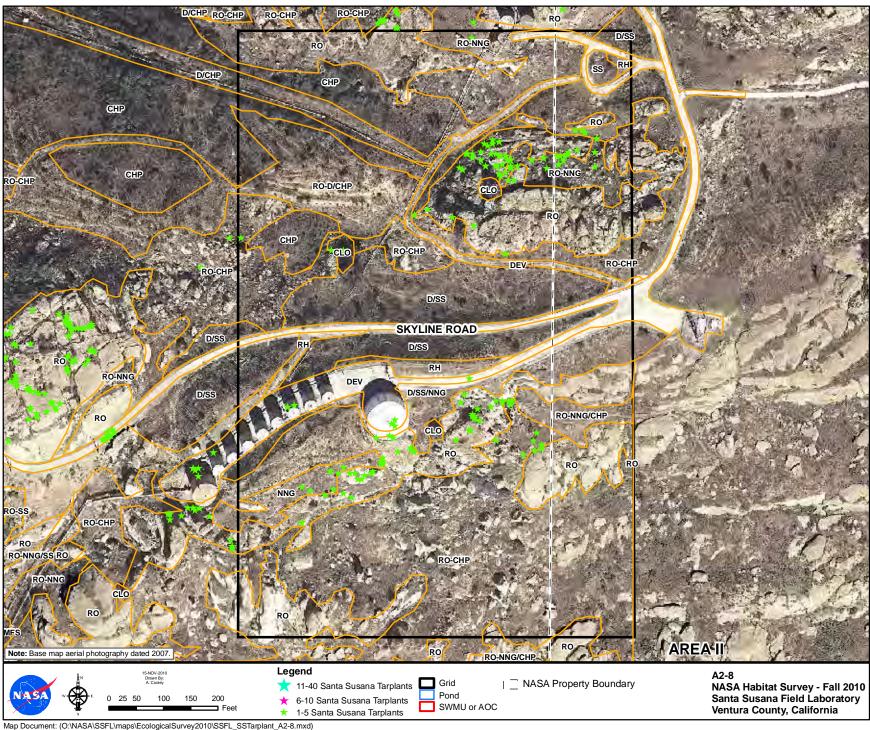
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-5.mxd)

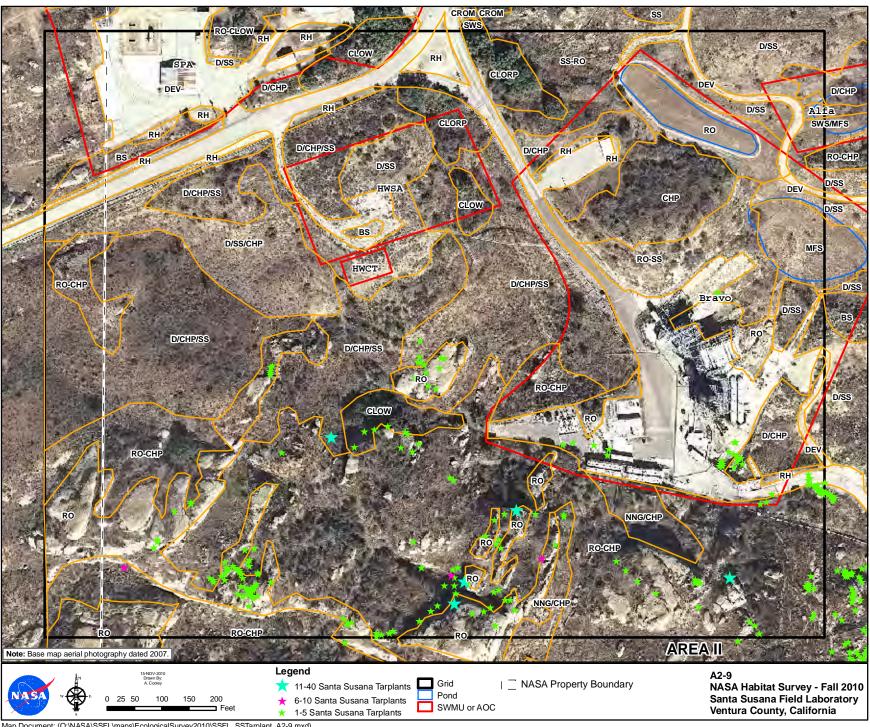


Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-6.mxd)

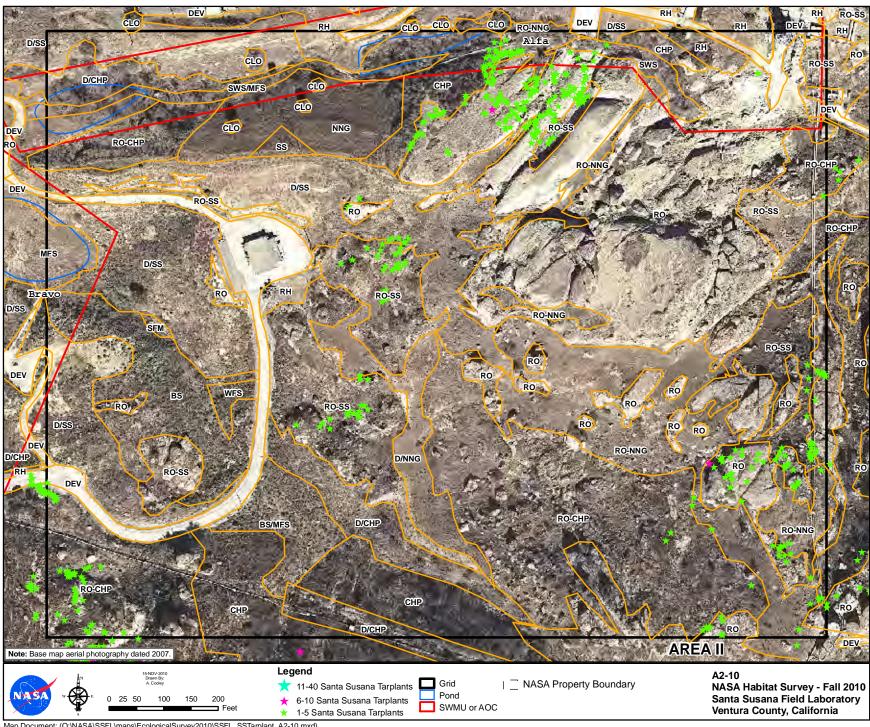


Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-7.mxd)

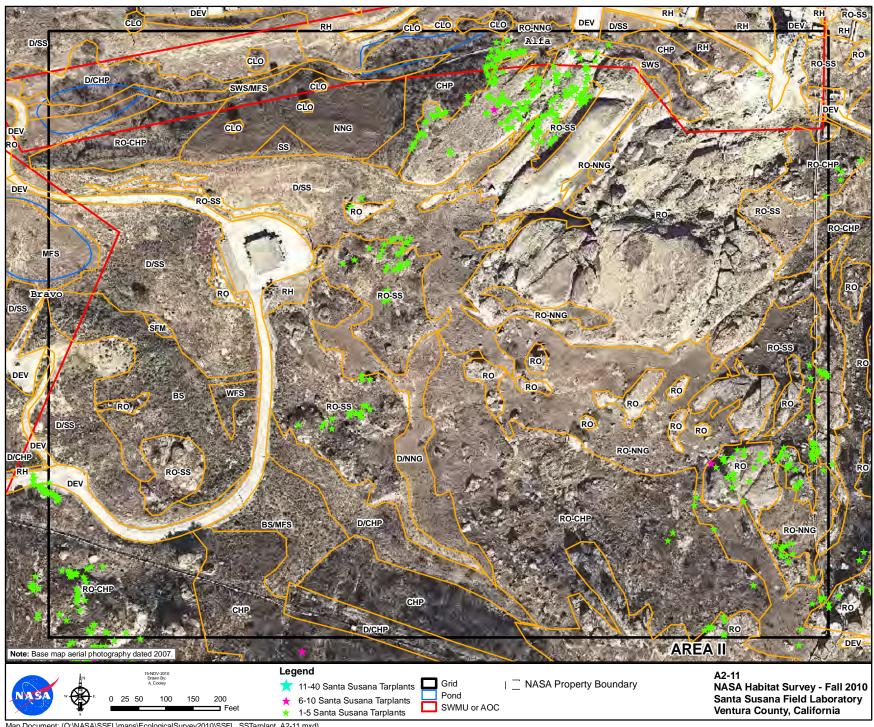




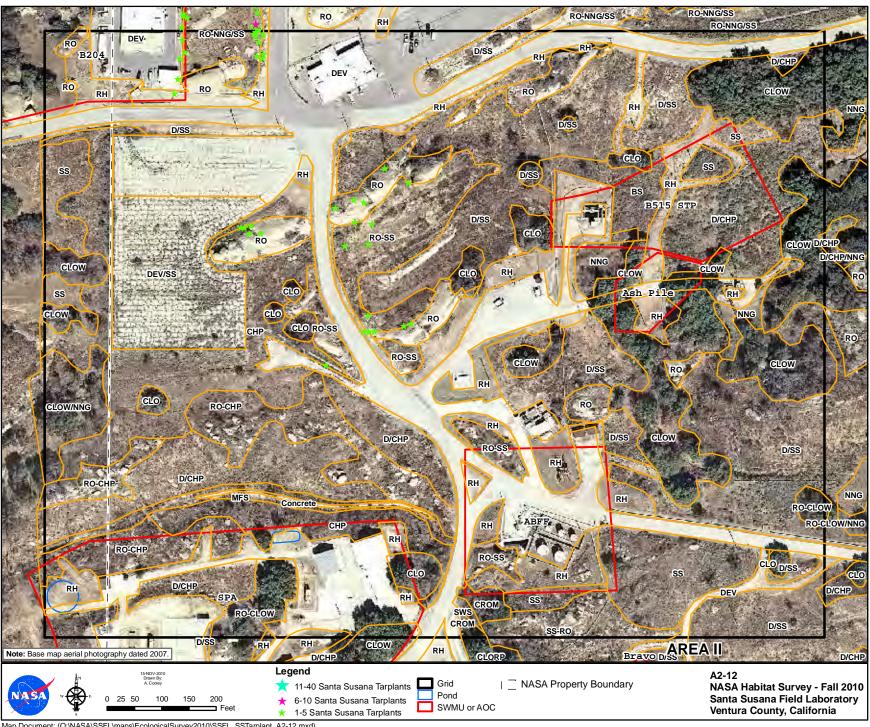
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-9.mxd)



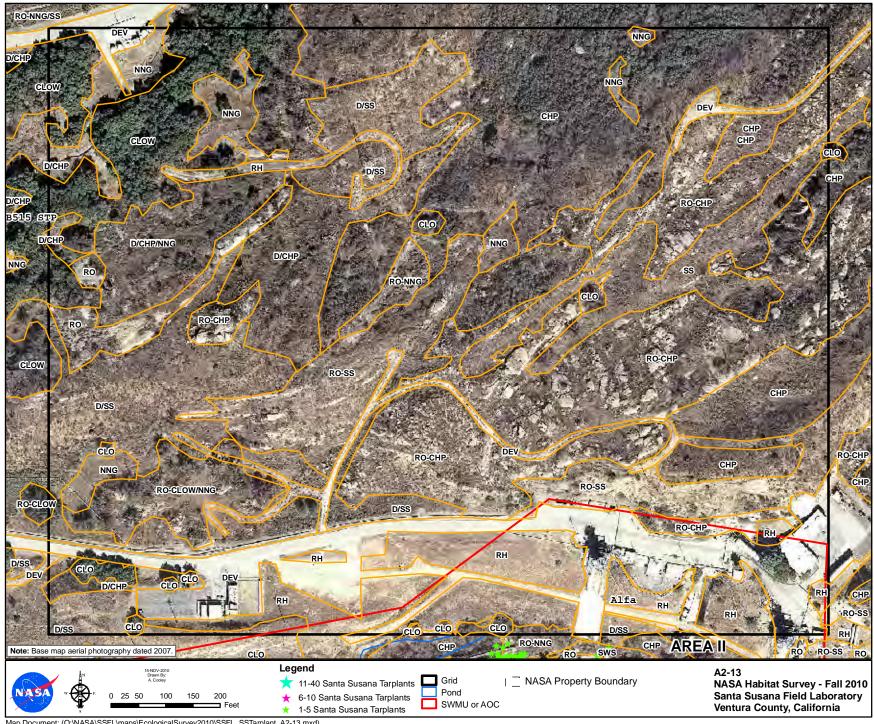
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-10.mxd)



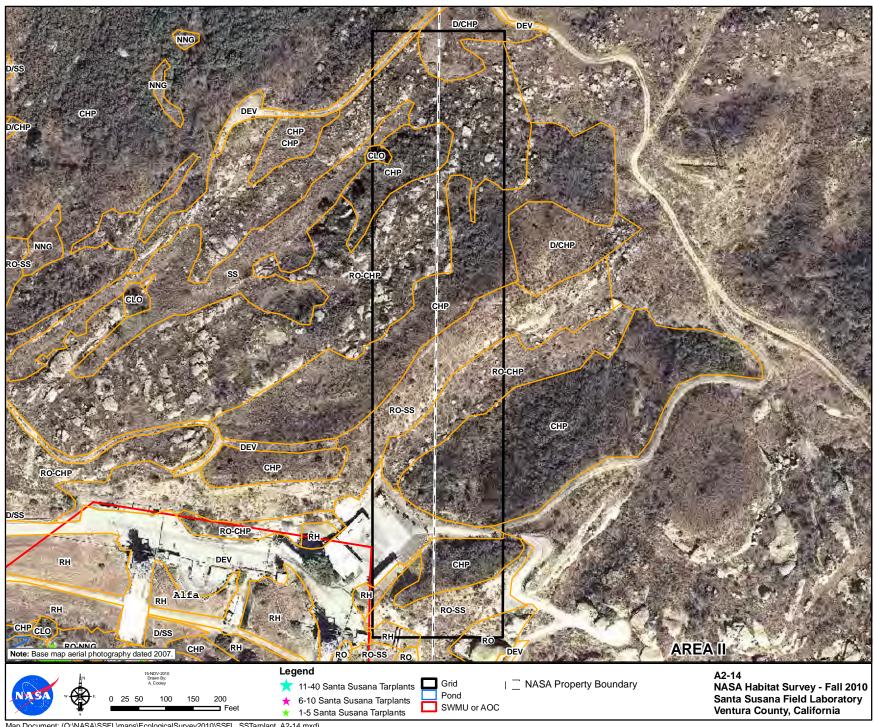
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-11.mxd)



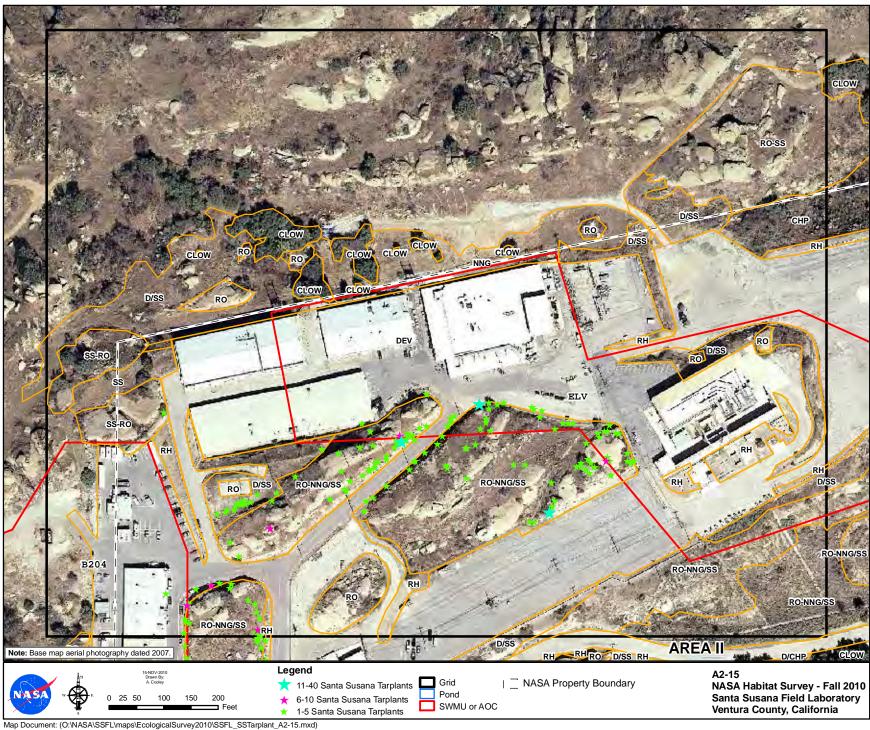
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-12.mxd)

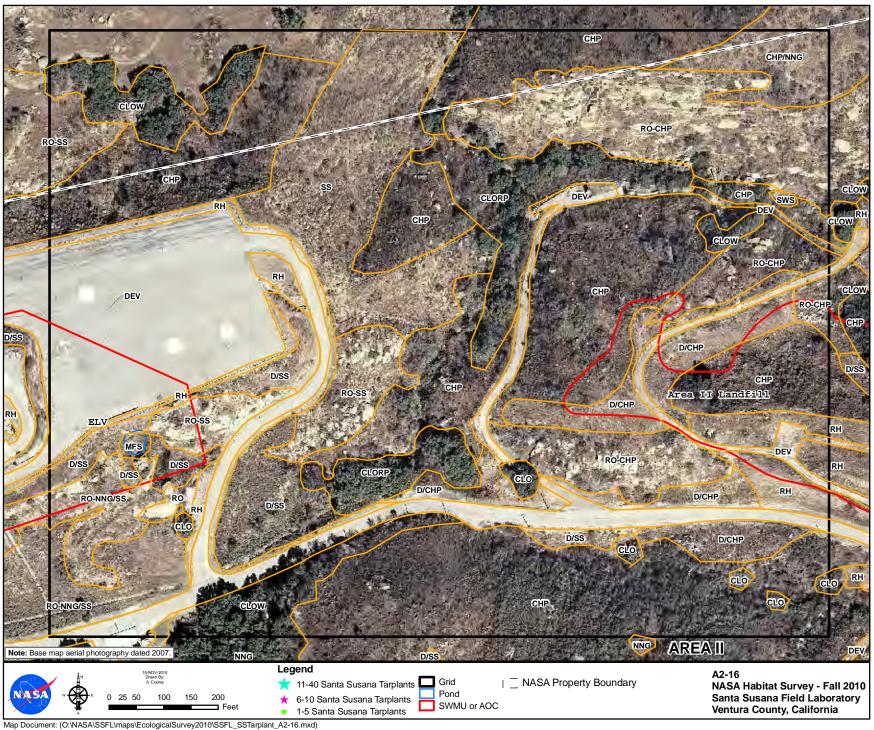


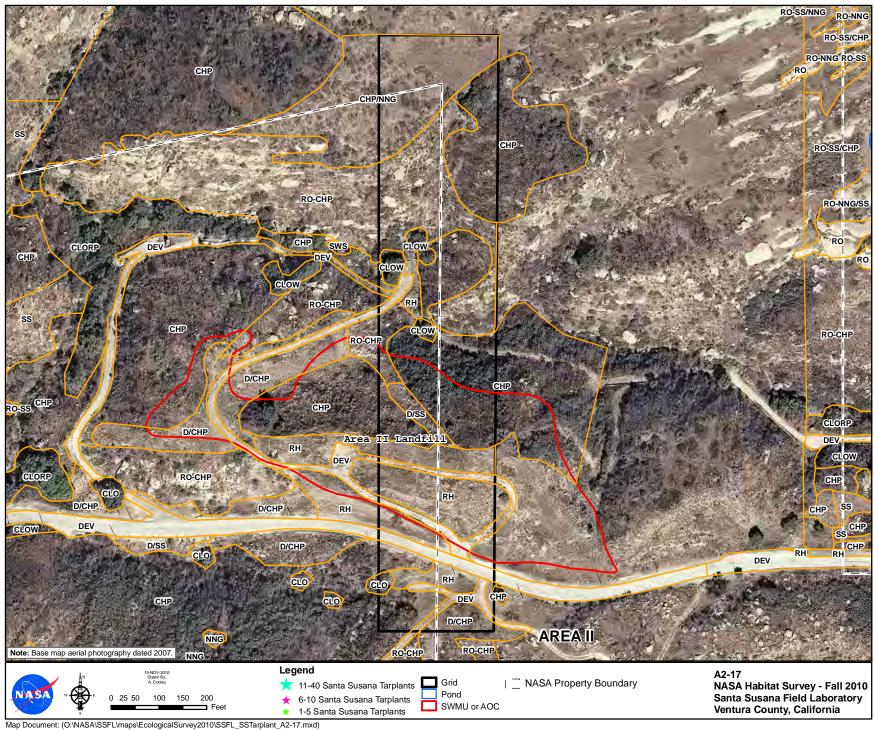
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-13.mxd)



Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-14.mxd)







This page intentionally left blank.

Appendix D, NASA	Appendix D, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup		
		Appendix G	
	Species of Inter		
	- F		

This page intentionally left blank.

<u>ID#:</u>	ST01	Lat/Long: 34°13'22.3"/118°41'08.9"

<u>Date:</u> 09/28/2010 <u>Investigators:</u> S. Long; G. Santolo

Associated NC Datasheet ID: None

Species: Santa Susana tarplant

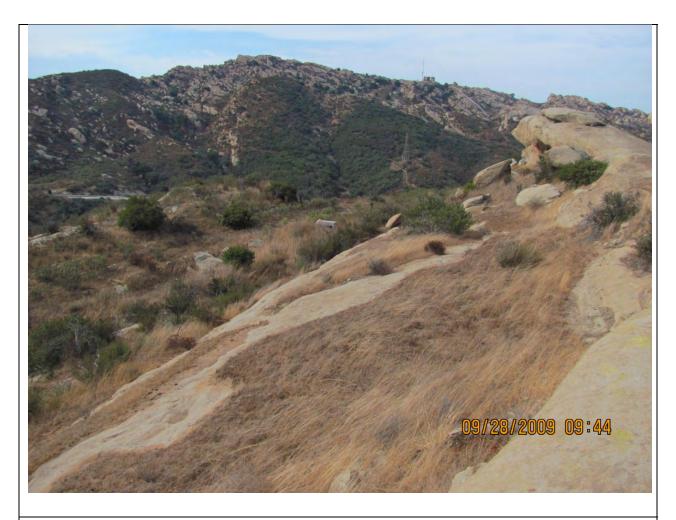
Population size: 1 individual

Community Type: RO CHP Photos: Attached

Habitat Description: Mid-slope up rock outcrop on sandy seam

Adjacent Disturbances: None apparent

Notes:



Accumulations in sandy rock seams where Santa Susana tarplant was observed.

Sr	ecies:	Santa	Susana	tarplant
----	--------	-------	--------	----------

<u>ID#:</u> ST14 <u>Lat/Long:</u> 34°13′26.5″/118°41′07.0″

<u>Date:</u> 09/28/2010 <u>Investigators:</u> S. Long; G. Santolo

Associated NC Datasheet ID: RO northeast corner

Population size: ST03 – ST25 (22 individuals)

<u>Community Type:</u> RO <u>Photos:</u> Attached

Habitat Description: Rock outcrop, sandstone, northern aspect

Adjacent Disturbances: Hiking trails in area, litter observed

Notes:



Rock outcrop, sandstone where Santa Susana tarplants were observed.

Species: Dudleya (parva?)

<u>ID#:</u> Dud801 <u>Lat/Long:</u> 34°13′29.6″/118°42′15.9″

<u>Date:</u> 10/08/2010 <u>Investigators:</u> S. Long; G. Santolo

Associated NC Datasheet ID: RO-NNG

Population size: 12 plants within a 15-foot (5-meter) radius

Community Type: Rock outcrop-non-native grassland Photos: Attached

<u>Habitat Description:</u> Patchy remnants of soil and NNG spread over exposed rock slope (sandstone); aspect is NW; slope approximately 22°; soil is bound with moss and lichen (biotic crust). Dominant vegetation: *Avena* sp. (oat), *Bromus madritensis* ssp. *rubens* (red brome), *Bromus diandrus* (ripgut brome), *Yucca schidigera* (yucca), *Deinandra minthornii* (Santa Susana tarplant)

Adjacent Disturbances: Erosion of rock slope

Notes: Small mammal burrows in soil



Rock outcrop-non-native grassland where dudleya were observed.

Species: Coast horned lizard

<u>ID#:</u> HL01 <u>Lat/Long:</u> 34°14'23.6"/118°41'11.1"

<u>Date:</u> 9/29/2010 <u>Investigators:</u> S. Long; G. Santolo

Associated NC Datasheet ID: RO- NE corner

<u>Population size:</u> 1 individual – juvenile about 1.5 inches

Community Type: RO Photos: None

Habitat Description: In sandy accumulations within rock outcrop undulations, hidden beneath Santa

Susana tarplant ST 110

Adjacent Disturbances: None apparent

Notes:

Species: Coast horned lizard

<u>ID#:</u> HL02 <u>Lat/Long:</u> 34°14'13.9"/118°41'34.9"

<u>Date:</u> 9/29/2010 <u>Investigators:</u> S. Long; G. Santolo

Associated NC Datasheet ID: RH801

Population size: 1 individual – juvenile about 1 inch

<u>Community Type:</u> Ruderal Habitat <u>Photos:</u> Attached

Habitat Description: Gravelly roadway on landfill

Adjacent Disturbances: Yes, vehicle access roadways and nearby monitoring well (PZ-134) about 30 feet

west.

Notes: Lizard about 1 inch long



Coast horned lizard

Species: Quino checkerspot butterfly (possible)

ID#: QCB 01 Lat/Long: 34°13'49.3"/118°41'58.6"

<u>Date:</u> 10/04/2010 <u>Investigators:</u> S. Long; G. Santolo

Associated NC Datasheet ID: RO- NNG

Population size: 1 individual

<u>Community Type:</u> RO NNG SS <u>Photos:</u> Habitat only

Habitat Description: Tall Avena fatua/red brome, chamise, laurel sumac, yerba santa, sage, branching

phacelia, Santa Susana tarplant

Adjacent Disturbances: Area was previously burned

<u>Notes:</u> No apparent plantago species observed. Individual flew away quickly in a zig-zag pattern suggesting it was a male QCB.



Habitat where possible Quino checkerspot butterfly was observed.

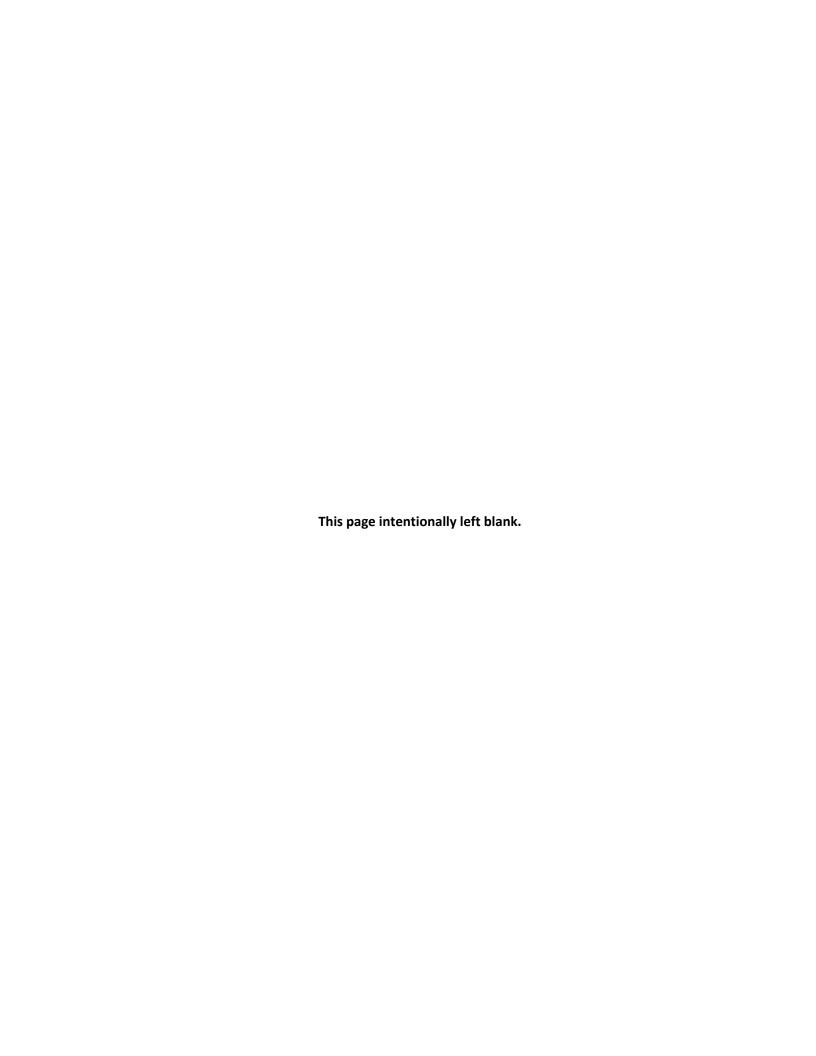
This page intentionally left blank.

End of Appendix D

This page intentionally left blank.

APPENDIX E

2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory



2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

National Aeronautics and Space Administration

Huntsville, Alabama

December 2011

This page intentionally left blank.

Acrony	ms and	Abbrev	riations	v					
1	Introd	uction		1-1					
	1.1	Purpo	se	1-1					
	1.2	Backg	round	1-1					
	1.3	Locati	on and Environmental Setting	1-1					
		1.3.1	General	1-1					
		1.3.2	Habitat Types	1-5					
		1.3.3	Soils	1-10					
		1.3.4	Climate Summary	1-10					
2	Metho	ds		2-1					
	2.1	ical Surveys	2-1						
		2.1.1	Pre-field Preparation	2-1					
		2.1.2	Reference Populations	2-5					
		2.1.3	Field Surveys	2-9					
		2.1.4	Sensitive Habitat Types	2-9					
		2.1.5	Noxious and Invasive Weeds	2-10					
	2.2	Wildli	fe Surveys	2-10					
3	Result	s		3-1					
	3.1	Specia	ıl-Status Plant Species	3-1					
		3.1.1	Santa Susana tarweed (Deinandra minthornii)	3-1					
		3.1.2	Slender mariposa lily (Calochortus clavatus var. gracilis)	3-1					
		3.1.3	Plummer's mariposa lily (Calochortus plummerae)	3-1					
	3.2	Sensit	ive Habitats	3-1					
	3.3	Noxio	us and Invasive Weeds	3-5					
	3.4	Specia	Il-Status Animal Species	3-5					
	3.5	Wildlif	fe Observations	3-11					
4	Conclu	isions a	nd Recommendations	4-1					
	4.1 Conclusions								
	4.2	Recon	nmendations	4-1					
5	Refere	nces		5-1					
Append	divac								
Append		l-Status	Plants Identified in the Database Review Not Expected to Occur on the Site						
В	•		erence Site Photographs						
C			pecies Observed						
D		•							
E	-	Representative Photographs of the Site, Special-status Plants, and Wildlife Species Wildlife Species Observed in 2010 and 2011							
Tables									
1-1	Manne	ad Hahi+	at Types and Current California Vegetation Classification System	1 (
2-1			Plant Species that Potentially Occur on the NASA-administered Property at SSFL						
3-1			nvasive Weeds Identified on the NASA-administered Property at SSFL						
2-1	INUXIUL	us ariu ii	ivasive vveeus identified on the IVASA-admillistered Property at SSFL	3-5					

Figures

1-1	Regional Map	
	Site Overview	
1-3	NRCS Soil Mapping Units	
2-1	Special Status Plant Reference Locations	
3-1	Special-Status Plant Locations	
3-2	Sensitive Natural Communities	
3-3	Significant Wildlife Observations	

Acronyms and Abbreviations

Boeing The Boeing Company

Cal-IPC California Invasive Pest Plant Council

CDFA California Department of Food and Agriculture
CDFG California Department of Fish and Game
CNDDB California Natural Diversity Data Base

CNPS California Native Plant Societies
EIS Environmental Impact Statement

ENTS Laboratory Engineered Natural Treatment Systems

ESA Endangered Species Act

PF Degree Fahrenheit

ft Feet

GIS Geographic information system
GPS global positioning system

LOX Liquid oxygen

NAD North American Datum

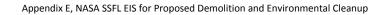
NASA National Aeronautics and Space Administration

NRCS Natural Resources Conservation Service
RCRA Resource Conservation and Recovery Act

RFI RCRA Facility Investigation

SAIC Science Applications International Corporation

SSFL Santa Susana Field Laboratory
SSURGO Soil Survey Geographic Database
USFWS U.S. Fish and Wildlife Service
WRCC Western Regional Climate Center



SECTION 1

Introduction

This report presents the findings of special-status plant species and wildlife surveys conducted in 2011 on the National Aeronautics and Space Administration (NASA)-administered property at Santa Susana Field Laboratory (SSFL) in southern California. SSFL was established shortly after World War II and has been used primarily as a site to develop and test nuclear reactors, rockets, and missiles. The 2,850-acre site is divided into four production and two buffer areas (Areas I, II, III, and IV, and the northern and southern buffer zones). A portion of SSFL is federally owned property that is administered by NASA. The remaining property at SSFL is owned by The Boeing Company (Boeing). The NASA-administered property at SSFL consists of 41.7 acres within Area I and all 409.5 acres of Area II. The Boeing Company owns the remainder of Area I, all of Areas III and IV, and the northern and southern buffer areas at the site.

1.1 Purpose

This report presents the results of protocol-level botanical surveys and opportunistic wildlife surveys of the NASA-administered property at SSFL. These biological surveys were conducted to support NASA's preparation of a Ecological Stewardship Plan for the property it administers at SSFL. The findings also will be used as the basis for the biological resources section of the Environmental Impact Statement (EIS) being prepared to assess the potential impacts of NASA's proposal to demolish structures and to remediate soil and groundwater on the NASA-administered property at SSFL. This report has been prepared as a supplement to the *Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory* (NASA, 2011).

1.2 Background

In April 2008 and May 2009, ecological surveys were conducted on portions of the NASA-administered property at SSFL as part of Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) (NASA, 2008; 2009a; 2009b). The fall 2010 habitat and listed species surveys (NASA, 2011) together with the 2011 botanical and wildlife surveys are intended to expand on the past ecological surveys through a survey of the entire NASA-administered property at SSFL, including some limited areas outside the RFI areas that had not been surveyed previously.

Several other ecological studies conducted at SSFL between 2005 and 2009 were reviewed for potential insight into the biological resources on the NASA-administered property:

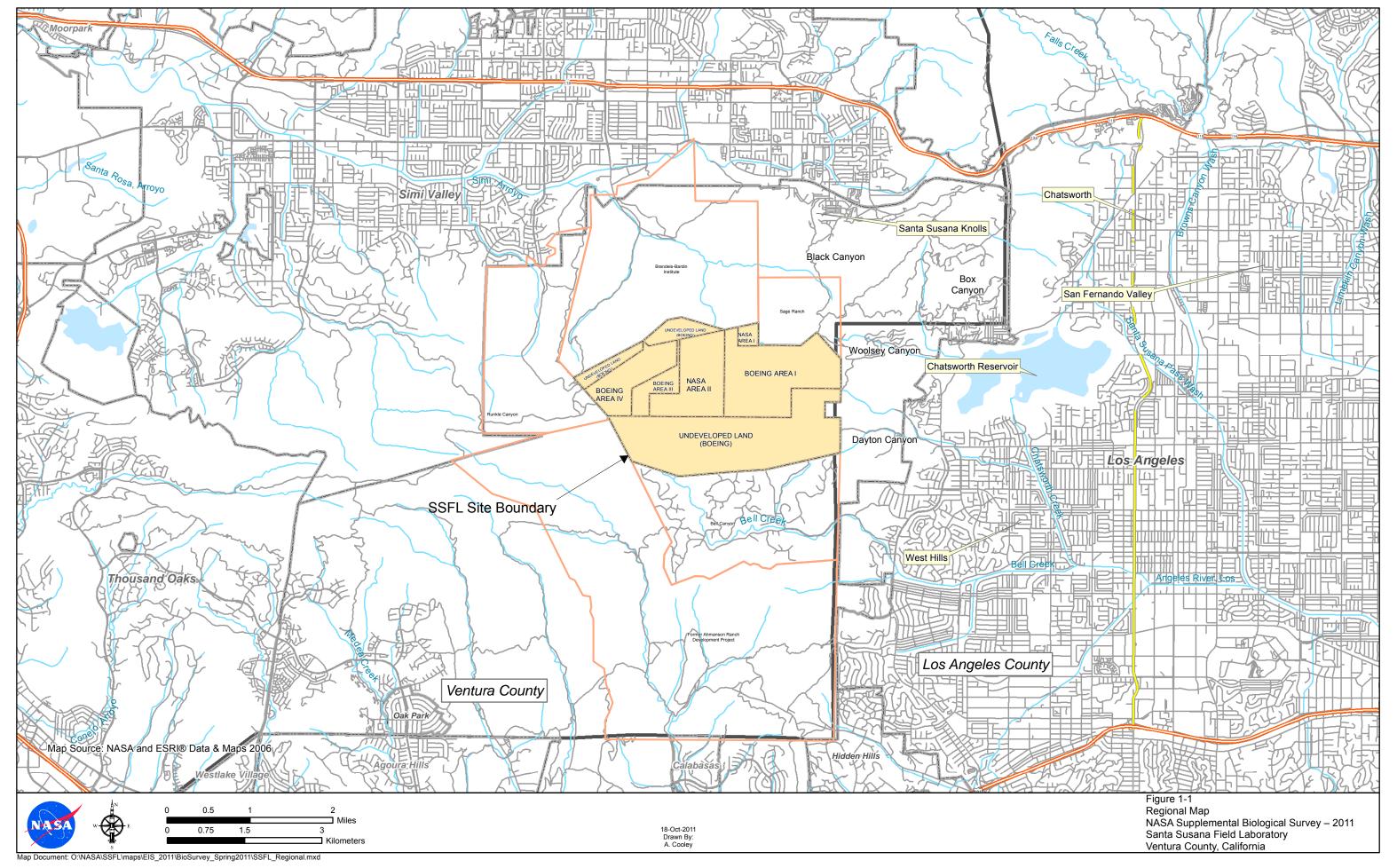
- MWH Americas, Inc., and AMEC Earth & Environmental, Inc. (2005)
- MWH Americas, Inc., and ERM (2007)
- Ogden Environmental and Energy Services Co., Inc. (1998)
- Padre Associates, Inc. (2008)
- Science Applications International Corporation (SAIC) (2009)

1.3 Location and Environmental Setting

Section 1.3 is summarized from a more detailed environmental setting description contained in the *Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory* (NASA, 2011). Additional information regarding physiography, geology, and habitat types also is included in that report.

1.3.1 General

SSFL is approximately 29 miles northwest of downtown Los Angeles in the southeastern corner of Ventura County, California. SSFL is located mostly within an unincorporated part of Ventura County; its easternmost portion extends slightly into an unincorporated part of Los Angeles County (Figure 1-1). It encompasses 2,850 acres within a remote, mountainous area near the crest of the Simi Hills at the western border of the San Fernando Valley.



Area I LOX Plant and Area II are in the central and north-central parts of SSFL, respectively (Figure 1-2). The 451.2 acres of the NASA-administered property at SSFL represents approximately 16 percent of the total site area.

SSFL's landscape is characterized by sandstone outcropping hills. Numerous industrial facilities, constructed drainage systems, and roadways have been developed within this hilly landscape. The site is within the central portion of the Southern California Coast ecological subregion in the Simi Valley–Santa Susana Mountains (261Be) ecological subsection. This subsection includes steep mountains; moderately steep to steep hills; and nearly level to gently sloping floodplains, terraces, and alluvial fans (Miles and Goudey, 1998).

1.3.2 Habitat Types

Habitat surveys of the NASA-administered property conducted during fall 2010 identified eight natural terrestrial habitat types, two aquatic habitat types, and ruderal and developed areas (NASA, 2011). These habitat types are described briefly in the following text. Table 1-1 cross-references the mapped habitat types and the current California vegetation classification system (Sawyer et al., 2009).

Chaparral

Chaparral is the most abundant and widespread natural community at the site. This habitat covers 172.6 acres (approximately 38 percent) of the NASA-administered property. Characteristic species include chamise (*Adenostoma fasciculatum*), hoaryleaf ceanothus (*Ceanothus crassifolius*), black sage (*Salvia mellifera*), laurel sumac (*Malosma laurina*), thickleaf yerba santa (*Eriodictyon crassifolium*), Mendocino bushmallow (*Malacothamnus fasciculatus*), and chaparral yucca (*Yucca whipplei*). The abundance of these species is variable within this habitat type depending on soils, aspect, past disturbance, and other environmental factors.

Venturan Coastal Sage Scrub

Venturan coastal sage scrub covers 64.4 acres (approximately 15 percent) of the site. Characteristic species include coastal sagebrush (*Artemisia californica*), Eastern Mojave buckwheat (*Eriogonum fasciculatum* var. *fasciculatum*), black sage, chaparral yucca, thickleaf yerba santa, and common deerweed (*Acmispon glaber*).

Non-native Grassland

Grassland habitat covers 19.2 acres (approximately 4 percent) of the site and often occurs in a mosaic with other habitat types. Most of the grasslands are characterized by slender oat (*Avena barbata*), intermixed with other introduced annual grasses such as ripgut brome (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), and fescue (*Vulpia* spp). Native grasses including needlegrass (*Nassella* spp.), littleseed muhly (*Muhlenbergia microsperma*), and deergrass (*Muhlenbergia rigens*) are present in a few areas, but generally provide only minimal cover. Common herbaceous species include suncup (*Camissonia* spp.), winecup clarkia (*Clarkia purpurea*), longbeak stork's bill (*Erodium botrys*), and winter vetch (*Vicia villosa*).

Coast Live Oak Woodland

Coast live oak woodland is distributed widely across the site but only makes up 13.2 acres (approximately 3 percent) of the NASA-administered property. This habitat is characterized by mature coast live oak (*Quercus agrifolia*) trees. The understory generally consists of annual grasses such as ripgut brome and slender oat, with occasional native grasses including blue wildrye (*Elymus glaucus*) and California brome (*Bromus carinatus*). The understory shrub layer is poorly developed and, where present, generally consists of scattered Pacific poison oak (*Toxicodendron diversilobum*).

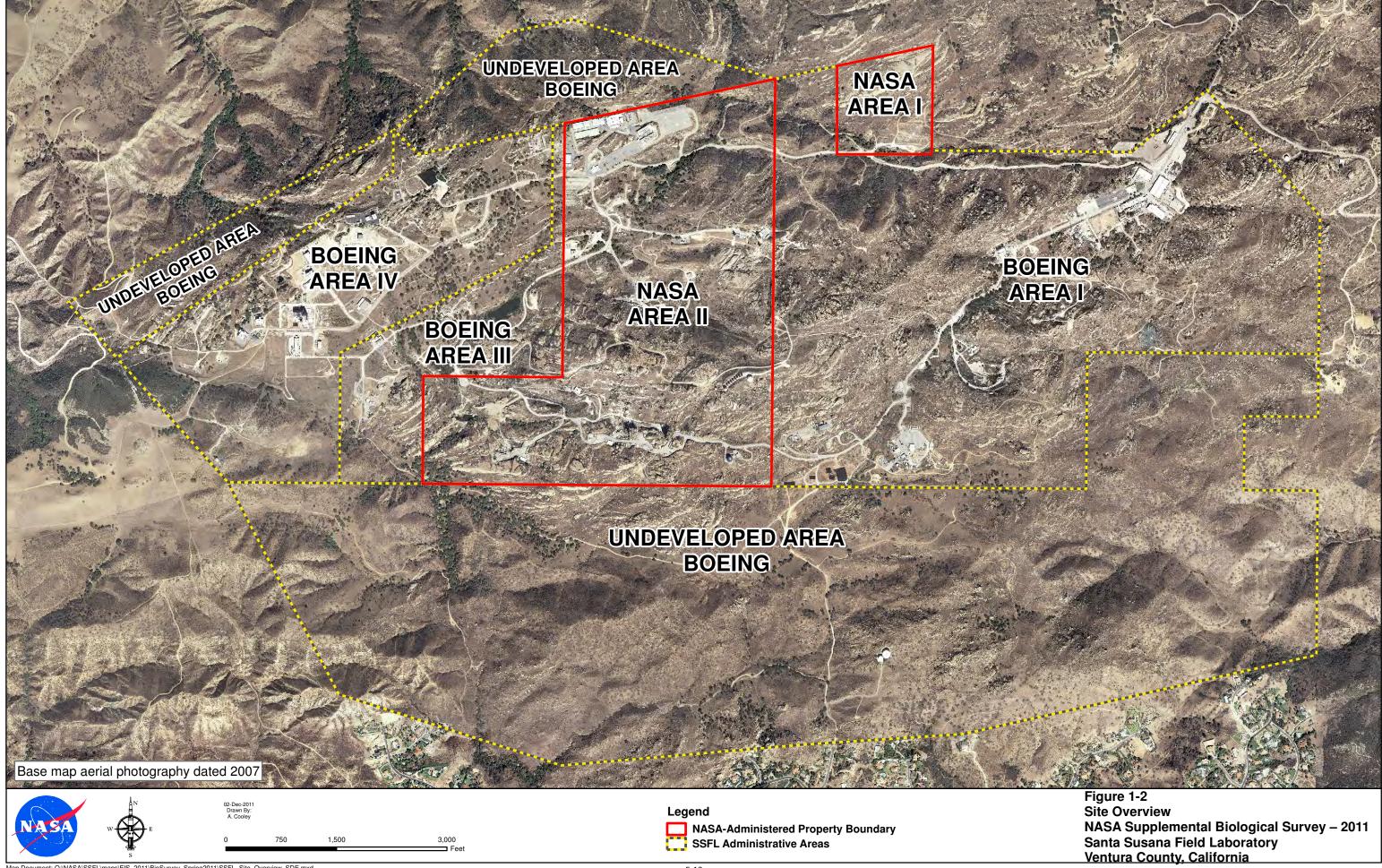


TABLE 1-1
Mapped Habitat Types and Current California Vegetation Classification System
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Mapped Natural Habitat Types	Current California Vegetation Classification System ¹
Chaparral	Adenostoma fasciculatum – Salvia mellifera Shrubland Alliance
	Malosma laurina Shrubland Alliance
	Malacothamnus fasciculatus Shrubland Alliance
	Eriodictyon crassifolium Provisional Shrubland Alliance
Venturan Coastal Sage Scrub	Artemisia californica – Eriogonum fasciculatum Shrubland Alliance
Non-Native Grassland	Avena(barbata, fatua) Semi-Natural Herbaceous Stands
Coast Live Oak Woodland	Quercus agrifolia Woodland Alliance
Coast Live Oak Riparian Forest	Quercus agrifolia Woodland Alliance
Baccharis Scrub	Baccharis pilularis Shrubland Alliance
Mule-fat Scrub	Baccharis salicifolia Shrubland Alliance
Southern Willow Scrub	Salix lasiolepis Shrubland Alliance

Note:

SSFL = Santa Susana Field Laboratory

Coast Live Oak Riparian Forest

Coast live oak riparian forest is found along the edges of the seasonal streams on the site. This habitat type covers 9.2 acres (approximately 2 percent) of the NASA-administered property. The composition of this community is generally similar to the coast live oak woodland habitat described previously, although the understory typically is more diverse in these areas and includes species such as Douglas' sagewort (*Artemisia douglasiana*), creeping snowberry (*Symphoricarpos mollis*), and American black elderberry (*Sambucus nigra*).

Baccharis Scrub

Baccharis scrub is limited, covering only 2.6 total acres (less than 1 percent) of the site. This community is characterized by generally pure stands of coyotebrush (*Baccharis pilularis*). In these areas, coyotebrush ranges from dense cover with a sparse herbaceous layer to more open stands with an understory composed of annual grasses and scattered forbs.

Mule-fat Scrub

Mule-fat scrub is limited, covering 2.1 acres (less than 1 percent) of the site. This habitat type is characterized by localized, dense stands of mule-fat (*Baccharis salicifolia*).

Southern Willow Scrub

Southern willow scrub habitat on the NASA-administered property is characterized by arroyo willow (Salix lasiolepis) intermixed with occasional red willow (Salix laevigata) and narrowleaf willow (Salix exigua). This habitat type is uncommon on the site, covering only 1 acre (less than 1 percent). Southern willow scrub occurs in localized patches around scattered ponds and detention basins and along portions of the seasonal drainages within the site.

Aquatic Habitats

Aquatic habitats identified on the NASA-administered property include 0.4 acre of open water and 0.2 acre of freshwater marsh habitat associated with various ponds and detention basins. Freshwater marsh is limited to the outer edges of ponds and detention basins and is characterized by southern cattail (*Typha domingensis*).

¹ Sawyer et al.(2009)

Sandstone Rock Outcrops

Approximately 91 acres (20 percent) of the NASA-administered property is composed of sandstone outcrops. In many areas, the outcrops are devoid of vegetation, while in other areas, the rocks are covered with a diverse assemblage of lichens. In some areas, scattered vascular plants are present. Common plants associated with theses rock outcrops include bushy spikemoss (*Selaginella bigelovii*), lanceleaf liveforever (*Dudleya lanceolata*), chalk dudleya (*Dudleya pulverulenta*), cliffbrake (*Pellaea* spp.), orange bush monkey flower (*Mimulus aurantiacus*), and Santa Susana tarweed (*Deinandra minthornii*).

Ruderal

Ruderal habitat is common around developed areas and areas that have been subject to human disturbance. Ruderal habitats cover approximately 17 acres (4 percent) of the site. Common species observed in these areas include telegraphweed (*Heterotheca grandiflora*), black mustard (*Brassica nigra*), Maltese star-thistle (*Centaurea melitensis*), silver bird's-foot trefoil (*Acmispon argophyllus*), stork's bill (*Erodium* spp.), and common deerweed.

Developed

Developed areas include paved roads, parking areas, buildings, test structures, and other developments. Approximately 58 acres, or 13 percent, of the NASA-administered property have been developed.

1.3.3 Soils

Three Natural Resources Conservation Service (NRCS) soil types occur within the NASA-administered property (NRCS, 2008). These soil types are described in the following text; Figure 1-3 shows their distribution on the property.

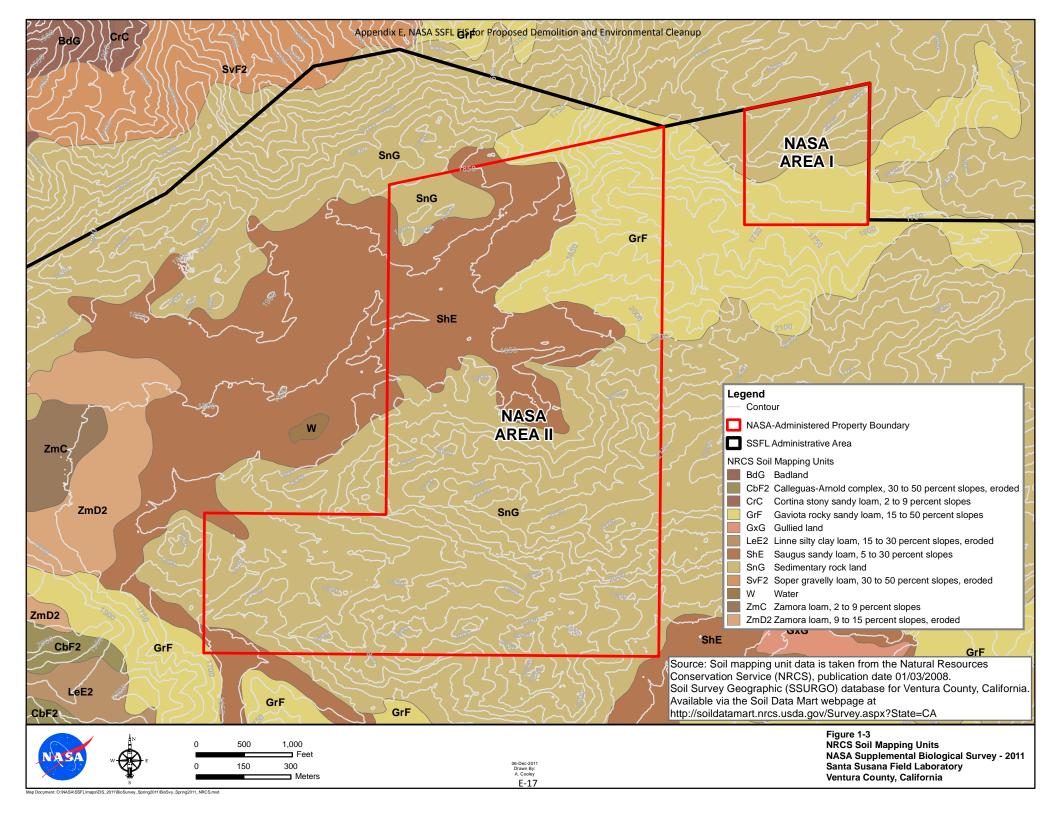
GrF–Gaviota rocky sandy loam, 15- to 50-percent slopes. This soil mapping unit occurs in the southern half of NASA Area I and in the northeastern corner of Area II. These soils are found on hills and mountains and have a very shallow or shallow to lithic (bedrock) contact. They are well to excessively well drained and are formed in material weathered from hard sandstone or meta-sandstone. These soils have very low to very high runoff and moderately rapid permeability.

ShE–Saugus sandy loam, 5- to 30-percent slopes. This soil mapping unit occurs in the northwestern and southwestern portions of Area II. This unit consists of deep, well-drained soils that formed from weakly consolidated sediments. They are found on dissected terraces and foothills. These soils have medium to rapid runoff and moderate permeability.

SnG–Sedimentary rock land. This soil mapping unit occurs in the northern half of NASA Area I and in the northwestern corner and southern half of Area II. This mapping unit consists mostly of exposed sedimentary rock with very thin, discontinuous areas of soil. There is little available information about this mapping unit; however, the potential for erosion is expected to be relatively low, based on the erosivity factors reported online and the relative lack of soil cover. It is expected that runoff is rapid and permeability is very low in these areas.

1.3.4 Climate Summary

Climate data from the Western Regional Climate Center (2011) Canoga Park area, which is approximately 7 miles southeast of SSFL, is considered generally representative of the regional climate for the site. Average temperatures range from a low of 39 degrees Fahrenheit (°F) in December and January to a high of 95°F in July and August. Average annual rainfall is 16.8 inches, most of which falls between November and March.



SECTION 2

Methods

2.1 Botanical Surveys

2.1.1 Pre-field Preparation

Preparation for the protocol-level special-status plant surveys included compiling a list of rare, threatened, or endangered plant species that have the potential to occur within the limits of the NASA-administered property at SSFL. For the purpose of this evaluation, a special-status plant is defined as any species that falls under one of the following classifications:

- Federally listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA)
- A candidate for federal listing under the ESA
- Listed threatened or endangered by the California Department of Fish and Game (CDFG) under the California Endangered Species Act
- Listed as rare under the California Native Plant Protection Act
- Considered rare, threatened, or endangered in California as determined by the California Native Plant Societies (CNPS) Rare Plant Inventory

The list of special-status plant species that potentially could occur on the NASA-administered property at SSFL was developed based on information from the California Natural Diversity Database (CNDDB) (CDFW, 2011b); CNPS (2011) Rare Plant Inventory; USFWS list of threatened, endangered, and candidate species for Ventura County (USFWS, 2011); and information from herbarium collections from the Jepson Online Interchange for California Floristics (University of California, 2011). The CNDDB and CNPS database searches included the following U.S. Geological Survey Quadrangles—Simi, Santa Susana, Oat Mountain, Thousand Oaks, Calabasas, Canoga Park, Point Dume, Malibu Beach, and Topanga.

The database searches and literature review identified 46 special-status plant species in the regional vicinity, 34 of which were considered to have the potential to occur on the NASA-administered property (Table 2-1). Appendix A contains a list of special-status plants identified in the data review that are considered unlikely to occur on the site.

Representative photographs of many of the special-status plant species were obtained from the Internet (CalPhotos, 2011) to facilitate field identification. Flowering periods provided by the CNPS Rare Plant Inventory (CNPS, 2011) were used to schedule field work to correspond with the appropriate blooming periods for the special-status plant species.

Ortho-rectified, 150-scale (1 inch = 150 feet [ft]) aerial photographs with overlain survey area boundaries were prepared as the base maps for the field surveys. These aerial photograph base maps were generated from the NASA geographic information system (GIS) database using the North American Datum (NAD) 1927 State Plane, California Zone V base datum coordinate system. Habitat mapping developed during the fall 2010 survey (NASA, 2011) also was overlain onto the base maps.

TABLE 2-1
Special-Status Plant Species that Potentially Occur on the NASA-administered Property at SSFL
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Scientific Name	Common Name	Status	Blooming Period	Habitat and Notes
Asplenium vespertinum	western spleenwort	4.2	Feb-June	Rocky areas in chaparral, cismontane woodland, and coastal scrub. Herbarium collection from Lake Sherwood area, approximately 10 miles southwest of the site.
Astragalus brauntonii	Braunton's milk-vetch	FE 1B.1	Jan-Aug	Chaparral, coastal scrub grassland, and closed-cone coniferous forest. Known to occur on Boeing-administered property at SSFL approximately 0.5 mile west of the site. Numerous reported occurrences in the regional vicinity.
Atriplex parishii	Parish's brittlescale	1B.1	June-Oct	Alkali meadows, vernal pools, chenopod scrub, and playas; usually found on drying alkali playas with fine soils. Limited suitable habitat on the site. The nearest reported occurrence is around Santa Monica, approximately 18 miles southeast of the site.
Baccharis malibuensis	Malibu baccharis	1B.1	Aug	Coastal scrub, chaparral, and oak woodland habitats. Several reported occurrences approximately 8 to 10 miles south of the site.
Calandrinia breweri	Brewer's calandrinia	4.2	Mar-June	Sandy or loamy soils in chaparral and coastal scrub. Several herbarium collections from Ventura County including the Santa Monica Mountains.
California macrophylla	round-leaved filaree	1B.1	Mar-May	Cismontane woodland and grassland; generally associated with clay soils. Three reported occurrences between 5 and 9 miles south of the site.
Calochortus catalinae	Catalina mariposa lily	4.2	Feb-June	Openings in chaparral, coastal scrub, and cismontane woodland and on grassy slopes. Numerous herbarium collections from Ventura County, including the Santa Monica Mountains.
Calochortus clavatus var. gracilis	slender mariposa lily	1B.2	Mar-June	Chaparral and coastal scrub, often in grassy areas within other habitats. Known to occur on SSFL property. Several additional reported occurrences in the regional vicinity of the site.
Calochortus fimbriatus	late-flowered mariposa lily	1B.2	June-Aug	Chaparral and cismontane woodland; often on serpentine. Three reported occurrences approximately 8 miles north of the site, including one associated with open woodland on sandstone parent material.
Calochortus plummerae	Plummer's mariposa lily	18.2	May-July	Coastal scrub, chaparral, grassland, cismontane woodland, and lower montane coniferous forests. Known to occur on SSFL property. Numerous reported occurrences in the regional vicinity of the site.
Centromadia parryi ssp. australis	southern tarweed	18.1	May-Nov	Edges of marshes, vernal pools, and vernally mesic grasslands. Limited suitable habitat present on the site. The only reported occurrence in the vicinity is a historical (1930) herbarium collection from Santa Monica (18 miles to the southeast).

TABLE 2-1
Special-Status Plant Species that Potentially Occur on the NASA-administered Property at SSFL
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Scientific Name	Common Name	Status	Blooming Period	Habitat and Notes
Chorizanthe parryi var. fernandina	San Fernando Valley spineflower	FC/CE 1B.1	Apr-July	Sandy soils in coastal scrub and rocky outcrops. Large population reported approximately 3.6 miles south of the site.
Chorizanthe parryi var. parryi	Parry's spineflower	1B.1	Apr-June	Dry sandy soils in coastal scrub, chaparral, and grassland; often at interface with oak woodland habitat. Only document occurrence in the vicinity is a 1957 herbarium collection approximately 14 miles south of the site. This occurrence is possibly extirpated.
Deinandra minthornii	Santa Susana tarweed	CR 1B.2	July-Nov	On sandstone outcrops in chaparral and coastal scrub. This species is widespread throughout much of the site. Numerous reported occurrences in the regional vicinity.
Delphinium parryi ssp. blochmaniae	dune larkspur	1B.2	Apr-May	Coastal dunes and maritime chaparral in dry sandy soils. Only two reported occurrences in vicinity of the site, both are in the coastal hills to the southwest. Nearest reported occurrence is associated with oak woodland habitat approximately 10.5 miles to the southwest of the site.
Dodecahema leptoceras	Slender-horned spineflower	FE/SE 1B.1	Apr-June	Chaparral and coastal scrub. There are no CNDDB occurrences or herbarium records for this species in Ventura County. Nearest reported occurrence is a historical collection (1893) from Newhall, approximately 13 miles northeast of the site. There is also an occurrence (possibly extirpated) approximately 17 miles east northeast of the site.
Dudleya blochmaniae ssp. blochmaniae	Blochman's dudleya	1B.1	Apr-June	Coastal scrub, grassland, and open rocky slopes; often in clay soil over serpentine or in rocky areas with little soil. Known to occur on SSFL (Boeing property). Other reported occurrence in the vicinity of Chatsworth Reservoir approximately 3 miles east of the site.
Dudleya cymosa ssp. agourensis	Agoura Hills dudleya	FT 1B.2	May-June	Rocky areas and volcanic breccias in chaparral and cismontane woodland habitats. Several known occurrences between 6 and 10 miles southwest of the site.
Dudleya cymosa ssp. marcescens	marcescent dudleya	FT/CR 1B.2	Apr-July	Chaparral, sheer rock surfaces, and rocky volcanic cliffs. Four reported occurrences between 8 and 9 miles south of the site.
Dudleya cymosa ssp. ovatifolia	Santa Monica dudleya	FT 1B.2	Mar-June	Chaparral and coastal scrub; often on north facing slopes in canyons associated with sedimentary conglomerates. Three known occurrences between 10 and 12 miles south of the site.
Dudleya multicaulis	many-stemmed dudleya	1B.2	Apr-July	Chaparral, coastal scrub and grassy slopes; often in heavy clay soils. Known to occur at SSFL (Boeing property). One reported CNDDB occurrence from a rocky outcrop approximately 3.5 miles east of the site.

TABLE 2-1
Special-Status Plant Species that Potentially Occur on the NASA-administered Property at SSFL
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Scientific Name	Common Name	Status	Blooming Period	Habitat and Notes
Dudleya parva	Conejo dudleya	FT 1B.2	May-June	Coastal scrub, grassland and rocky slopes; generally on clayey or volcanic soils. Two reported occurrences approximately 9 miles west of the site.
Dudleya verityi	Verity's dudleya	FT 1B.2	May-June	Volcanic and rocky outcrops in chaparral, coastal scrub, and cismontane woodland. Three reported occurrences between 15 and 19 miles west of the site.
Eriogonum crocatum	conejo buckwheat	CR 1B.2	Apr-July	Rocky areas in coastal scrub and grasslands. One reported occurrence approximately 10 miles southwest of the site.
Harpagonella palmeri	Palmer's grapplinghook	4.2	Mar-May	Chaparral, coastal scrub, and grassland; often on clay soils. One reported occurrence approximately 13 miles northeast of the site.
Horkelia cuneata ssp. puberula	mesa horkelia	1B.1	Feb-Sept	Sandy or gravelly sites in chaparral, cismontane woodlands, and coastal scrub. Several herbarium collections from Ventura County. All CNDDB occurrences are more than 30 miles to the west northwest of the site.
Lasthenia glabrata ssp. coulteri	Coulter's goldfields	18.1	Feb-June	Coastal salt marshes, playas, grasslands, and vernal pools; usually associated with alkaline soils in playas, sinks, and grasslands. Limited suitable habitat on the site. Two reported occurrences in the vicinity of the site. One is a 1933 herbarium collection approximately 13 miles south, near the Malibu lagoon. The other is approximately 4.5 miles east of the site, but the habitat and taxonomy of this occurrence are questionable.
Navarretia fossalis	spreading navarretia	FT 1B.1	Apr-June	Vernal pools, shallow freshwater marshes, playas, and chenopod scrub. Limited habitat present on the site. No reported occurrences in Ventura County. Nearest reported occurrences are between 19 and 20 miles northeast of the site.
Nolina cismontana	chaparral nolina	1B.2	May-July	Chaparral and coastal scrub; primarily on sandstone and shale substrates. Three reported occurrences within 3 to 6 miles west to southwest of the site.
Pentachaeta lyonii	Lyon's pentachaeta	FE/CE 1B.1	Mar-Aug	Chaparral and grassland habitats. Numerous reported occurrences of this species in the regional vicinity of the site. Nearest CNDDB occurrence is approximately 6.5 miles west of the site.
Phacelia hubbyi	Hubby's phacelia	4.2	Apr-June	Gravelly and rocky areas in coastal scrub, chaparral, and grassland habitats. Several herbarium collections from Ventura County, including the Santa Susana Mountains.
Phacelia ramosissima var. austrolitoralis ¹	south coast branching phacelia	3.2	Mar-Aug	Sandy or rocky sites in coastal scrub, chaparral, coastal dunes, and in coastal salt marshes. Herbarium records suggest that this variety is typically found in more coastal areas.

TABLE 2-1
Special-Status Plant Species that Potentially Occur on the NASA-administered Property at SSFL
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Scientific Name	Common Name	Status	Blooming Period	Habitat and Notes
Pseudognaphalium leucocephalum	white rabbit-tobacco	2.2	July-Dec	Sandy gravelly sites in coastal scrub, chaparral, riparian woodlands and cismontane woodland habitats. Known to occur on SSFL property.
Thelypteris puberula var. sonorensis	Sonoran maiden fern	2.2	Jan-Sept	Along streams, seeps, and in mesic meadows. One reported occurrence in a seepage area along a stream approximately 15 miles southwest of the site.

Notes:

CNDDB = California Natural Diversity Database

SSFL = Santa Susana Field Laboratory

Status Codes:

CE = State listed endangered species

CR = State listed rare species

FC = Candidate for federal listing as a threatened or endangered species

FE = Federally listed endangered species

FT = Federally listed threatened species

1B.1 = California Native Plant Society (CNPS) listed as rare, threatened, or endangered in California and elsewhere; considered seriously threatened in California.

1B.2 = CNPS listed as rare, threatened, or endangered in California and elsewhere; considered fairly threatened in California.

2.2 = CNPS listed as rare, threatened, or endangered in California and elsewhere; but more common elsewhere, considered fairly threatened in California.

3.2 – Plants about which more information is needed; a review list; considered fairly threatened in California.

4.2 – Plants of limited distribution; a watch list; considered fairly threatened in California.

Sources:

CNDDB RareFind Version 3.1.0 (CDFG, 2011b).

Online CNPS Inventory of Rare and Endangered Plants (8th Edition) (CNPS, 2011)

Threatened and Endangered Plants of Ventura County (USFWS, 2011)

Berkeley Consortium of California Herbaria (University of California, 2011)

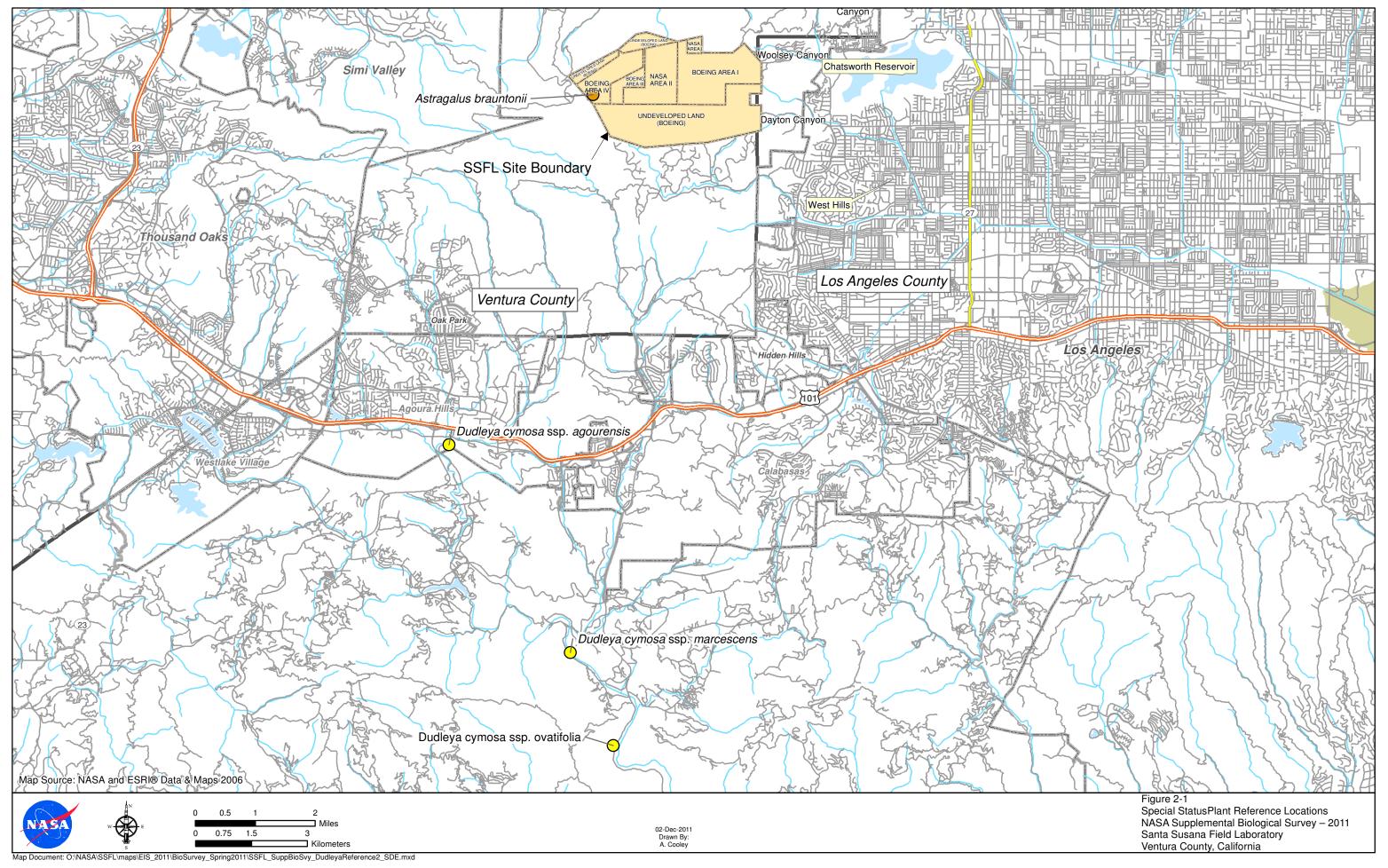
2.1.2 Reference Populations

Reference sites for four special-status plants were visited prior to or during the field surveys. Reference populations provide information about the current phenology, assist with proper identification of target species, and confirm that both the timing and environmental conditions are suitable for conducting the botanical surveys. Given the large number of potentially occurring plants, it was impractical to observe reference populations for all the target species. Imprecise location information, uncertainty of population status, distance from the site, and restricted access to private property also precluded visits to some reference locations.

The following reference sites were visited on the dates indicated; Appendix B provides photographs of reference populations.

Braunton's milk-vetch (*Astragalus brauntonii***):** A large number of individuals on a previously burned, north-facing hillside were observed on April 18, June 6, and August 15, 2011. This population is within the southern portion of Boeing Area IV (coordinates 34° 13′ 34.58788″ N; -118° 43′ 00.34798″ W), as shown in Figure 2-1. Plants were viewed in different development stages (budding, flowering, and fruiting) over the course of the three site visits.

¹ Phacelia ramosissima var. austrolitoralis—This variety is no longer recognized and is now considered a synonym for Phacelia ramosissima, according to the Jepson Online Interchange for California Floristics (University of California, 2011).



Agoura Hills Dudleya (*Dudleya cymosa* ssp. *agourensis*): A large number of individuals were viewed on a north facing rock slope on Cornell Road south of Agoura Hills on June 7, 2011 (coordinates 34° 08′ 29.33165″ N; -118° 45′ 28.64898″ W), as shown in Figure 2-1. The sandy-rocky slope was a road cut that exposed a former volcanic mud flow. Plants were viewed in flowering condition.

Marcescent Dudleya (*Dudleya cymosa* ssp. *marcescens*): Approximately 12 individuals were observed on an east-facing rock slope within Malibu Creek State Park approximately 2.9 miles south of State Highway 101 off Coastal Highway N1 (Malibu Canyon Road) on June 7, 2011 (coordinates 34° 05′ 29.36678″ N; -118° 43′ 19.91690″ W), as shown in Figure 2-1. The rock slope is adjacent to a dirt roadway and hiking trail and partially covered with moss and lichens. Plants were viewed in flowering condition.

Santa Monica Mountains Dudleya (*Dudleya cymosa* spp. *ovatifolia*): Numerous individuals were observed on a northeast-facing rocky slope along a small creek 5.4 miles south of State Highway 101 off Coastal Highway N1 (Malibu Canyon Road) on June 7, 2011 (coordinates 34° 04′ 08.80759″ N; -118° 42′ 34.32287″ W), as shown in Figure 2-1. The rock slope is a volcanic mud flow covered with mosses and lichens. Plants were viewed in flowering condition.

In addition to these rare plant reference locations, a site that had Palmer's Dudleya (*Dudleya palmeri*) was viewed on June 7, 2011, to observe the diversity of characteristics of this genus.

2.1.3 Field Surveys

The 2011 botanical field surveys were completed by Russell Huddleston, Steve Long, Gary Santolo, and Laurel Karren. The surveys were conducted in accordance with the USFWS botanical survey guidelines (1996), CDFG (2009), and CNPS (2001).

Field surveys were scheduled to capture the temporal variations in the occurrence of special-status plants. Surveys were conducted during the following periods: April 18 to 22, June 6 to 10, and August 15 to 20, 2011. Tarja Sagar, a botanist with the National Park Service's Santa Monica Mountains National Recreation Area, provided local expertise on plant identification and assisted with the botanical surveys on June 7, 2011. Surveys of the NASA-administered property involved more than 488 person hours.

The survey area included the entire NASA-administered property at SSFL. The field surveys were conducted via systematic walking. Because of the steep rugged terrain and impenetrable dense vegetation in some areas, transects were not used for all areas of the site. In areas where terrain, slope, or dense vegetation constrained access, observations were made from adjacent, safely accessible locations. The surveys were floristic in nature and the plant species observed were identified to the taxonomic level necessary to assess their conservation status. Appendix C includes the list of observed plant species observed. Samples of plants that could not be identified readily in the field were collected for later identification using taxonomic keys. Taxonomic keys and the following local flora and field guides were used to identify plant species in the field and from collected samples: the *Jepson Manual* (Hickman, 1993); *Flora of the Santa Ana River and Environs* (Clarke, et al., 2006); *Wildflowers of the Santa Monica Mountains* (McAuley, 1996); and *Flowering Plants: The Santa Monica Mountains, Coastal and Chaparral Regions of Southern California* (Dale, 1986). Appendix D contains representative photographs of special-status plants, sensitive habitat, and selected wildlife species observed during the survey. Special-status plant occurrences were recorded in the field using a Trimble Geo-XT global positioning system (GPS) device.

2.1.4 Sensitive Habitat Types

Sensitive habitats on the NASA-administered property at SSFL were evaluated based on the 2010 fall habitat mapping and descriptions (NASA, 2011). The status of the natural habitat types identified on the site was determined based on the current list of natural communities from the Vegetation Classification and Mapping Program (CDFG, 2011a). Habitat types assigned a rank of S1, S2, or S3 were considered high-priority conservation habitats. Habitat types ranked as S4 and S5 were not considered priority conservation types (CDFG, 2011a).

2.1.5 Noxious and Invasive Weeds

The 2011 surveys did not include detailed assessments or mapping of noxious and invasive weeds on the site; however, noxious and invasive weed species and their general locations were recorded as part of the floristic surveys. A noxious weed is a plant that has been defined as a pest plant by law or regulation, and for the purpose of this report, included any species listed by the California Department of Food and Agriculture (CDFA) as a noxious weed (2011). Invasive weeds include species that present an economic or ecological threat, but that are not subject to legal regulations. Invasive species include any plant with a high or moderate threat level, as identified by the California Invasive Pest Plant Council (CAL-IPC) (2011).

2.2 Wildlife Surveys

Opportunistic wildlife surveys were conducted concurrently with the special-status plant surveys. Direct observations, calls, and signs of wildlife (butterflies, amphibians, reptiles, birds, and mammals) were recorded during the field surveys. Searches under logs, rocks, and debris were conducted in limited cases where circumstances permitted. Binoculars were used to search for raptor nests on steep rocky cliffs, test stands, and other constructed structures. No protocol-level surveys were conducted, and wildlife observations were opportunistic rather than systematic, although the timing of the surveys presented the best opportunity for multiple seasonal observations. The locations of significant wildlife observations such as nest sites and special-status species sighted during the surveys were recorded by GPS (where accessible) or on aerial photographs (inaccessible locations). Potential habitat for aquatic species such vernal pool crustaceans and amphibians also was recorded during the surveys. Features such as potential seasonal wetlands and sandstone basins that have adequate size and structure to potentially hold enough water during the wet season to support aquatic biota were mapped with GPS. Appendix E contains a list of the wildlife species observed.

SECTION 3

Results

This section presents the findings of the 2011 surveys. Pertinent findings of the fall 2010 survey also are presented for context.

3.1 Special-Status Plant Species

No federal- or state-listed threatened or endangered plant species were observed on the NASA-administered property during the 2011 surveys. Santa Susana tarweed (*Deinandra minthornii*), which is listed as rare under the California Native Plant Protection Act, is widespread and abundant throughout much of the site. Two other plants included in the CNPS Rare Plant Inventory—slender mariposa lily (*Calochortus clavatus* var. *gracilis*) and Plummer's mariposa lily (*Calochortus plummerae*)—also were observed on the site. Additional information about these occurrences is provided in this section. None of the special-status species of Dudleya was observed on the NASA-administered property area during the 2011 surveys.

3.1.1 Santa Susana tarweed (*Deinandra minthornii*)

Santa Susana tarweed is a small leafy shrub in the sunflower family (Asteraceae). This species is listed as rare under the California Native Plant Protection Act as a CNPS 1B.2 (rare, threatened, or endangered in California and elsewhere and considered fairly endangered in California). Shrubs typically range from 1.5 to 3 ft tall and have numerous stiff stems ascending from the base. This plant produces a fragrant resin that makes the stems and leaves sticky. The yellow flower heads occur singly at the ends of the long stems. Blooming generally occurs from July through early November.

During the fall 2010 survey, more than 3,600 Santa Susana tarweeds were identified and mapped on the NASA-administered property (NASA, 2011). The majority of the plants were observed in Area II, where they were widespread throughout the area in association with sandstone outcrops. A total of 324 plants were mapped in Area I; most were found on a sandstone outcrop north of the Liquid Oxygen (LOX) Plant site. The areas containing Santa Susana tarweeds were visited during the 2011 surveys; no changes to the overall distribution were noted.

3.1.2 Slender mariposa lily (Calochortus clavatus var. gracilis)

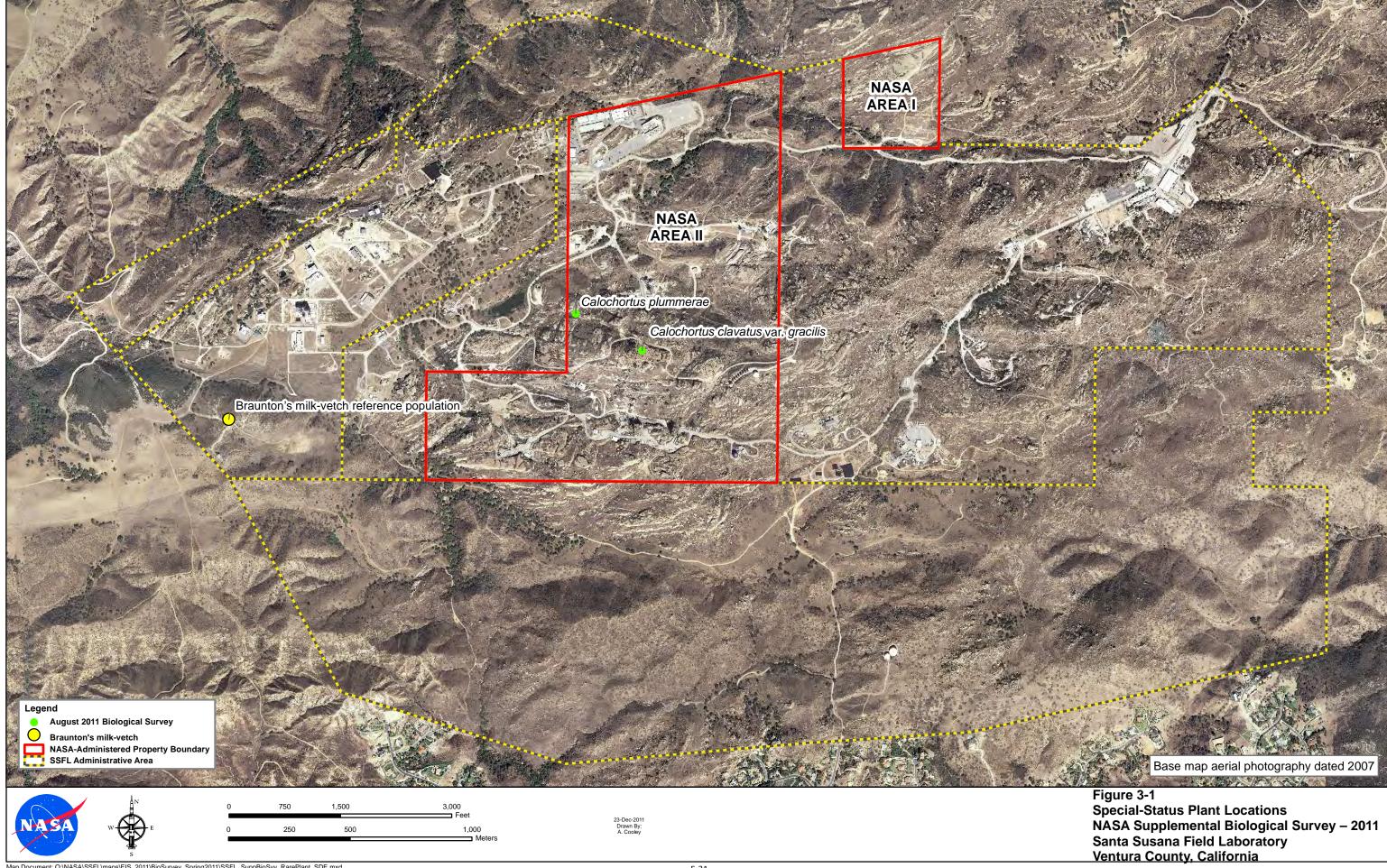
Slender mariposa lily is a perennial herb in the lily (Liliaceae) family. Stems are slender and typically between 7 and 12 inches tall with withering basal leaf. The yellow flowers are sparsely hairy with a reddish-brown line above small, shallow nectary. Several plants were observed in small sand pockets associated with dense patches of bushy spikemoss on a sandstone outcrop on the southern side of Skyline Road in Area II (Figure 3-1).

3.1.3 Plummer's mariposa lily (Calochortus plummerae)

Plummer's mariposa lily is a perennial herb in the lily (Liliaceae) family. The stem generally ranges from 1 to 2 ft tall and is often branched. Basal leaves are generally 8 to 16 inches long, withering later in the season. Leaves along the stem range from 1.5 to 7 inches long and are inrolled toward the ends. The pink to purple flowers are finely toothed with a central ring of long, yellow to orange hairs above the nectary. Two plants were observed in a sandy opening in the chaparral habitat on the western side of the Bravo test stand in Area II (Figure 3-1).

3.2 Sensitive Habitats

Two high-priority conservation natural habitats, as defined by the CDFG (2011a), were identified and mapped on the NASA-administered property during the fall 2010 survey—southern willow scrub and Venturan coastal sage scrub (NASA, 2011). These habitats have been assigned a state ranking of either S2 (community is considered imperiled



due to a restricted range, steep declines, or other factors that make it vulnerable to extirpation from the state), or S3 (the habitat is considered vulnerable with a moderate risk of extirpation due to a restricted range, recent declines, or other factors). Figure 3-2 shows the distribution of sensitive habitat types identified on the NASA-administered property at SSFL.

3.2.1.1 Southern Willow Scrub (S2)

Southern willow scrub, which is relatively limited on the site (1.04 total acres), is associated with seasonal drainages, as well as with more permanent water sources. Small areas of this habitat type were identified in Area II along the drainages north of the Area II landfill and the Coca test stand site, and around the R-2 Ponds and the Coca detention pond. The largest area of southern willow scrub on the NASA-administered property occurs along the drainage on the southern side of the Alfa test stand site (Figure 3-2).

3.2.1.2 Venturan Coastal Sage Scrub (S3)

Venturan coastal sage scrub is widespread throughout the site, covering a total of 64.44 acres. The largest areas of this habitat occur in the southwestern part of Area II. This habitat generally is intermixed with chaparral and rock outcrops (Figure 3-2).

3.3 Noxious and Invasive Weeds

A total of 14 invasive plant species were identified on the NASA-administered property during the 2011 surveys. Five of the species identified are classified by the state as noxious weeds. Table 3-1 lists the noxious and invasive weeds that were identified and the general locations in which they were observed.

3.4 Special-status Animal Species

Five CDFG Species of Special Concern occurrences have been documented by CNDDB (CDFS, 2011b) within the general vicinity of SSFL—western spadefoot toad (*Spea hammondii*), arroyo toad (*Anaxyrus californicus*), San Diego desert woodrat (*Neotoma lepida intermedia*), tricolored blackbird (*Agelaius tricolor*), and western mastiff bat (*Eumops perotis californicus*). The arroyo toad also is federally listed as endangered.

No evidence was found during the 2010 or 2011 surveys indicating the potential occurrence of any of these species, except for the San Diego desert woodrat. Evidence of potential occurrence of woodrat species (woodrat nests and scat) was found during the surveys; however, the species of woodrat on the site was not identified. No species-specific surveys have been conducted.

During the recent EIS public scoping period, USFWS commented that the following federally listed animal species have the potential to occur on the site:

- Quino checkerspot butterfly (Euphydryas editha ssp. quino)—Endangered
- Riverside fairy shrimp (Streptocephalus woottoni)—Endangered
- Vernal pool fairy shrimp (Branchinecta lynchi)—Threatened
- California red-legged frog (Rana aurora ssp. draytonii)—Threatened
- Least Bell's vireo (Vireo bellii ssp. pusillus)—Endangered
- Coastal California gnatcatcher (Poliptila californica ssp. californica)—Threatened

In addition to these species, the federally endangered longhorn fairy shrimp (*Branchinecta longiantenna*) was identified during the 2010 fall survey as having the potential to occur in seasonally inundated pools on rock outcrops on the NASA-administered property (NASA, 2011).

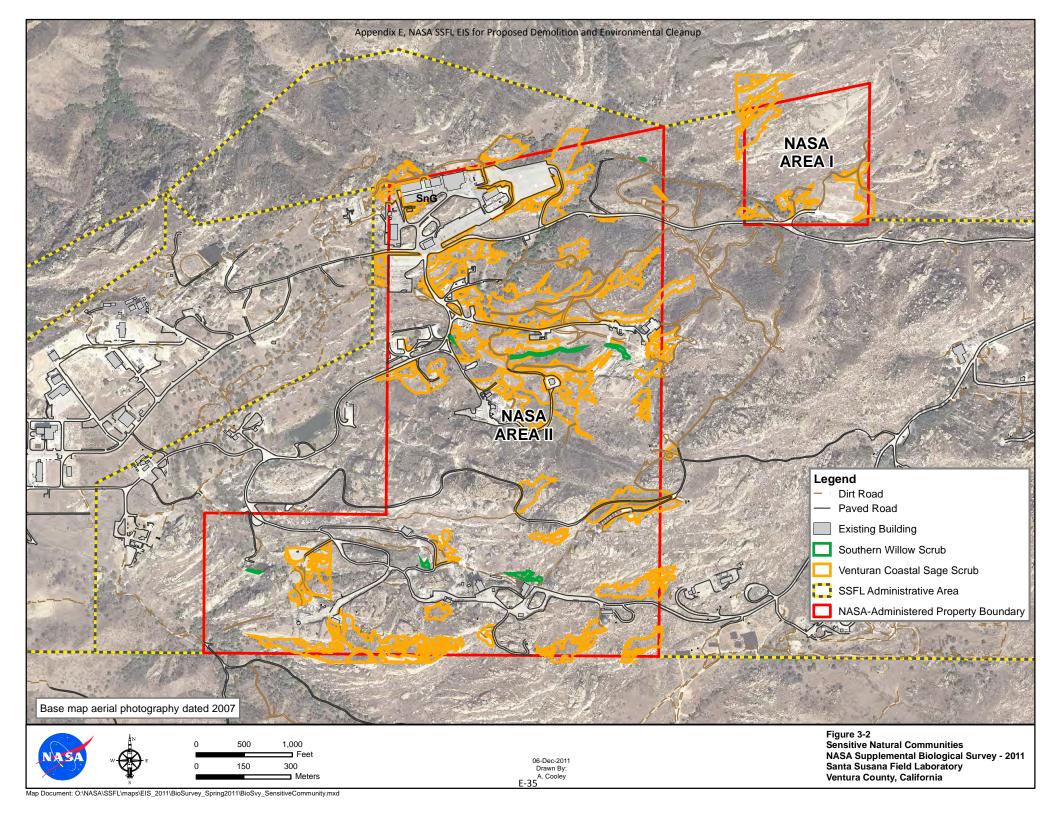


TABLE 3-1
Noxious and Invasive Weeds Identified On the NASA-administered Property at SSFL
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Scientific Name	Common Name	CDFA	CAL-IPC	Areas Observed
Ailanthus altissima	tree of heaven	С	Moderate	Area II–SPA, Delta and Coca
Brassica nigra	black mustard		Moderate	Widespread in grassland habitats, chaparral openings, and disturbed areas throughout the site
Bromus diandrus	ripgut brome		Moderate	Common in grasslands and in the understory of oak woodland habitat
Bromus madritensis ssp. rubens	red brome		High	Widespread in grasslands and on sandstone outcrops
Carduus pycnocephalus	Italian plumeless thistle	С	Moderate	Locally abundant in grasslands and in the understory of oak woodland habitat
Centaurea melitensis	Maltese star-thistle	С	Moderate	Widespread in grasslands, openings in chaparral, and in disturbed areas
Cirsium vulgare	bull thistle	С	Moderate	Area II—WTC, SPA, Coca, and R9 Pond
Cynodon dactylon	Bermudagrass		Moderate	Area II–Coca
Foeniculum vulgare	sweet fennel		High	Area II–R9 Pond
Gazania linearis	treasureflower		Moderate	Observed in one location south of Skyline road
Mesembryanthemum crystallinum	Common iceplant		Moderate	Alfa and Bravo—around developed areas including test stands and buildings.
Pennisetum setaceum	crimson fountaingrass		Moderate	Common and widespread, often around developed areas.
Salsola tragus	prickly Russian thistle	С	Limited	Area II–Alfa
Vulpia myuros ssp. myuros	rat-tail fescue		Moderate	Common in grassland habitats

Notes:

CDFA = California Department of Food and Agriculture

Cal-IPC = California Invasive Pest Plant Council

SSFL = Santa Susana Field Laboratory

CDFA - List C Noxious weeds

List C includes noxious weeds that are of known economic or environmental detriment and are usually widespread. They are subject to regulations designed to retard spread or to suppress at the discretion of the individual county agricultural commissioner. There is no state enforced action other than providing for pest cleanliness.

CAL IPC Ratings

High—species that have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate—species that have substantial and apparent, but generally not severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited—species that are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Sources:

California Department of Food and Agriculture, 2011. State List of Noxious Weeds.

California Invasive Pest Plant Council, 2011. Invasive Plant Inventory.

Species-specific surveys were not conducted during the 2010 or 2011 surveys for these federally listed wildlife species; however, the potential occurrence of these species on the site was evaluated during the opportunistic wildlife surveys that were conducted.

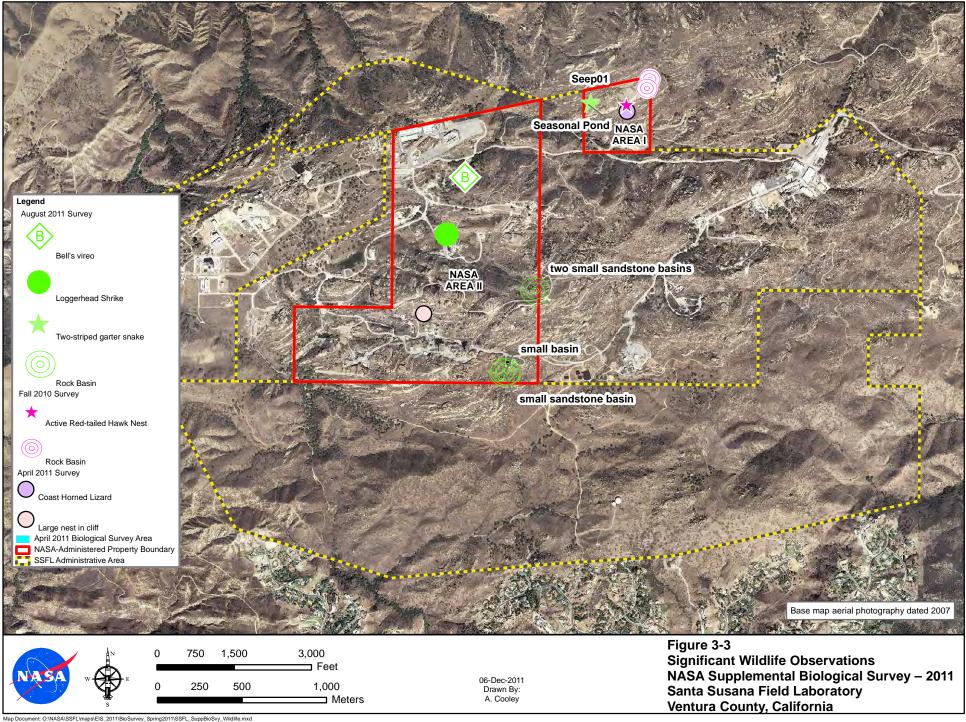
One least Bell's vireo was sighted during the August 2011 survey in coyotebrush adjacent to coast live oak woodland habitat west of the Ash Pile in Area II (Figure 3-3). This sighting occurred outside the typical breeding period of this species (April 10 to July 31); therefore, one explanation for the presence of the bird sighted is that it might have been a transient moving through the area. Mule-fat, a favored plant of the least Bell's vireo, exists on the site; however, the coverage of mule-fat scrub habitat is relatively limited (2.1 total acres) and fragmented. No least Bell's vireos were observed or heard during surveys conducted during their breeding period.

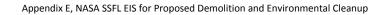
The Quino checkerspot butterfly potentially was sighted on the NASA-administered property during the fall 2010 survey. One individual butterfly that might have been this species was sighted southwest of the Bravo test stand site in mosaic habitat consisting of rock outcrop, non-native grassland, and Venturan coastal sage scrub. The butterfly was observed in flight, and a positive identification was not possible; however, its color, markings, and flight pattern were observed to be similar to those of the Quino checkerspot butterfly. Potential suitable habitat for this species was observed onsite during the 2010 and 2011 surveys. Dotseed plantain (*Plantago erecta*), a potential host plant for this species, was found during surveys conducted in 2011. Other potential food (nectar) plants for the butterfly, including Coulter's snapdragon (*Antirrhinum coulterianum*); California goldfields (*Lasthenia gracilis*); *Cryptantha* spp.; and pinebush (*Ericameria pinifolia*) were also observed during the 2011 surveys. A site assessment for Quino checkerspot butterfly completed by Forensic Entomology Services (2010) in Area IV concluded that the potential for occurrence was very low because the butterfly has not been sighted in Ventura County for more than 70 years and overall habitat at SSFL was considered marginal. A habitat survey for this species is planned within the NASA-administered properties for spring 2012.

One ring-tailed cat (*Bassariscus astutus*) was sighted on a rock outcrop near a riparian drainage northwest of the SPA site during the fall 2010 field surveys. The ring-tailed cat is a California "fully protected" species, which means it cannot be taken or possessed at any time.

The findings of the 2010 and 2011 surveys indicate that potential suitable habitat for the Riverside, vernal pool, and longhorn fairy shrimps exist on the NASA-administered property. Potential habitat includes small rock basins in sandstone outcrops and two seasonally ponded wetland areas. Opportunistic surveys for these species will be done in conjunction with planned wetland delineation fieldwork scheduled for January 2012.

No evidence of California red-legged frog occurrence was found during the 2010 or 2011 surveys. There is limited potential suitable habitat for this frog species on the NASA-administered property, primarily around the R-2 Ponds and the detention basin north of the Coca test stand site. A habitat assessment for California red-legged frog conducted by SAIC (2010) at several locations within SSFL (including the R2-A pond and Outfall 18 on the NASA property) determined that the presence of this species is unlikely. The coastal California gnatcatcher was not observed during the 2010 or 2011 surveys. Small, fragmented populations of gnatcatcher occur in Ventura County in habitat near where sage scrub-grassland interfaces; this species is less likely to be found in habitat where sage scrub grades into chaparral, such as was observed on the site. Dense sage scrub is occupied less frequently than more open sites.





The following Species of Special Concern were sighted during the 2010 and 2011 surveys—coast horned lizard (*Phrynosoma coronatum* [*blainvillii* population]), two-striped garter snake (*Thamnophis hammondii*), and loggerhead shrike (*Lanius ludovicianus*) (Figure 3-3):

- A coast horned lizard was sighted during the spring 2011 survey. Approximately 3 inches long, it was sighted on the LOX Plant site beneath a cliff. Two individuals of this species also were observed during the fall 2010 surveys near the Area II landfill and north of the LOX Plant site in Area I.
- A two-striped garter snake was observed under debris in the seasonal pond northwest of the LOX Plant site during the August 2011 survey.
- A loggerhead shrike was sighted foraging on a hill above the viewing stand at the Bravo test stand site during the August 2011 survey. One individual also was observed during the fall 2010 surveys on the eastern side of the SPA site in Area II.

3.5 Wildlife Observations

Observations of wildlife on the NASA-administered property at SSFL were recorded during the 2010 and 2011 surveys. Appendix E lists the animal species identified on the site via sightings, calls, and other evidence of occurrence. A total of 11 butterfly species, 12 herpetile (reptiles and amphibians) species, 60 bird species, and at least 15 mammal species were identified during the surveys. Numerous common invertebrate species also were observed besides butterflies such as dragonflies and milkweed bugs.

A total of three inactive raptor stick nests were sighted during the fall 2010 survey. During the 2011 surveys, two of these nests were observed to be occupied by red-tailed hawks (*Buteo jamaicensis*) and successfully fledged young. A pair of ravens (*Corvus corax*) successfully fledged young from a nest on a test stand at the Alfa test stand site. An adult barn owl (*Tyto alba*) was observed in a test stand at the Coca test stand site; it is likely that owls use these structures for nesting. In addition, several California towhee nests were observed on the ground in the chaparral and coastal sage scrub areas.

SECTION 4

Conclusions and Recommendations

4.1 Conclusions

No federal- or state-listed threatened or endangered plant species were identified within the NASA-administered property at SSFL during the 2011 surveys. Santa Susana tarweed, which is listed as rare under the California Native Plant Protection Act, is widespread and abundant throughout much of the site. Two other plants included in the CNPS Rare Plant Inventory—slender mariposa lily and Plummer's mariposa lily—also were observed on the site.

Two sensitive habitat types are present on the NASA-administered property. These included 1.04 acres of southern willow scrub habitat and 64.44 acres of Venturan coastal sage scrub habitat.

A total of 14 invasive plant species were identified during the 2011 surveys. Five of the identified species are classified by the state as noxious weeds.

Species-specific surveys for special-status animal species were not conducted during the 2011 surveys; however, opportunistic wildlife observations were recorded during both the 2010 and 2011 field surveys. A total of 10 butterfly species, 13 herpetile (reptiles and amphibians) species, 60 bird species, and at least 15 mammal species were identified during the surveys. The least Bell's vireo was the only federally listed animal species sighted during the 2011 surveys. One individual was sighted during the August 2011 survey. This sighting occurred outside the typical breeding period of this species (April 10 to July 31); therefore, the bird sighted might have been a transient moving through the area.

One potential Quino checkerspot butterfly was observed during the fall 2010 surveys, but no similar looking individuals were observed during the 2011 field surveys.

One California state fully protected species, the ring-tailed cat, was observed during the fall 2010 surveys. This species was not seen during the 2011 field surveys.

Three Species of Special Concern were sighted during the 2011 surveys—coast horned lizard, two-striped garter snake, and loggerhead shrike. Two coast horned lizards and one loggerhead shrike were observed during the fall 2010 surveys.

4.2 Recommendations

Pre-construction surveys by a qualified wildlife biologist are recommended before any proposed demolition, remediation, or other activities involving potential disturbance to wildlife or natural communities are initiated. This approach is especially important if the activities will occur during the breeding season for birds or wildlife. A breeding season schedule will be developed as part of the EIS and used in evaluating potential impacts to listed and protected species.

Because the rock basins and seasonal wetlands are found in areas that are unlikely to be affected by remediation or other onsite activities, protocol-level surveys for special-status invertebrates in these areas are not considered necessary. However, if it is later determined that the basins could be affected, it will be necessary to coordinate with resource agencies to evaluate what additional data might be needed or how mitigation of the impacts should occur.

A delineation of wetlands and waters of the United States and the State of California will be completed during the winter of 2011. These results will be documented in a separate wetland delineation report that will be submitted as in a separate report that will be submitted to the US Army Corps of Engineers for verification.

SECTION 5

References

California Department of Fish and Game. 2009. *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities*. Available at: http://www.dfg.ca.gov/habcon/plant/.

California Department of Fish and Game. 2011a. Natural Communities List. Vegetation Mapping and Classification Program. Available at: http://www.dfg.ca.gov/biogeodata/vegcamp/natural_comm_list.asp. October.

California Department of Fish and Game. 2011b. California Natural Diversity Database (CNDDB). RareFind Version 3.1.0.Sacramento, California.

California Department of Food and Agriculture. 2011. Noxious Weed Pest Rating List. Available at: http://www.cdfa.ca.gov/phpps/ipc/weedinfo/winfo list-pestrating.htm. October.

California Native Plant Society (CNPS). 2001. *Botanical Survey Guidelines*. Available at: http://www.cnps.org/cnps/rareplants/pdf/cnps survey guidelines.pdf.

California Native Plant Society (CNPS). 2011. *California Native Plant Society's Electronic Inventory of Rare and Endangered Plants of California*. Available on line at:

http://www.cnps.org/cnps/rareplants/inventory/index.php. March

California Invasive Pest Plant Council (Cal-IPC). 2011. *California Invasive Plant Inventory*. Berkeley, California. www.cal-ipc.org, October.

CalPhotos: Plants. 2011. University of California, Berkeley. Available on line at: http://calphotos.berkeley.edu//flora/. March.

Clarke, Oscar F., Danielle Svehla, Greg Balmer, and Arlee Montalvo. 2006. Flora of the Santa Ana River and Environs. Heyday Books.

Dale, Nancy. 1986. Flowering Plants: The Santa Monica Mountains, Coastal and Chaparral Regions of Southern California. March.

Forensic Entomology Services. 2010. Site Assessment for Quino Checkerspot Butterfly, Santa Susana Field Laboratory (SSFL) Area IV, Ventura County, California. Prepared for Science Applications International Corporation (SAIC). July 15.

Hickman, J.C. (ed.). 1993. *The Jepson Manual. Higher Plants of California*. University of California Press, Berkeley, California.

MWH Americas, Inc and AMEC Earth & Environmental, Inc. 2005. *Addendum to the Biological Conditions Report Santa Susana Field Laboratory, Ventura County, California*. Prepared for The Boeing Company, National Aeronautics and Space Administration, and U.S. Department of Energy.

MWH Americas, Inc and ERM. 2007. *Group 4 – Southern Portion of Area II RCRA Facility Investigation Report Santa Susana Field Laboratory, Ventura County, California. Plant Health Study for Group 4 Report Area.* Volume IV, Appendix E, Attachment E5, Ecological Surveys conducted in January 2006 and January 2007. Prepared for National Aeronautics and Space Administration. August.

McAuley, Milt. 1996. Wildflowers of the Santa Monica Mountains. Second Edition.

Miles, Scott and Charles Goudey (editors). 1998. *Ecological Subregions of California*. United States Department of Agriculture, Forest Service. Pacific Southwest Division. R5-EM-TP-005-Net. San Francisco.

National Aeronautics and Space Administration (NASA). 2008. *Draft Group 2 RCRA Facility Investigation*, Santa Susana Field Laboratory, Ventura County, California. Ecological Surveys conducted in April 2008. December.

National Aeronautics and Space Administration (NASA). 2009a. *Draft Group 3 RCRA Facility Investigation*, Santa Susana Field Laboratory, Ventura County, California. Ecological Surveys conducted in April 2008. May.

National Aeronautics and Space Administration (NASA). 2009b. *Draft Group 9 RCRA Facility Investigation*, Santa Susana Field Laboratory, Ventura County, California. Ecological Surveys conducted in May 2008. November.

National Aeronautics and Space Administration (NASA). 2011. Final Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory, Ventura County, California. Ecological Surveys conducted in September 28 through October 8, 2010. February.

Natural Resources Conservation Service (NRCS). 2008. Soil Survey Geographic (SSURGO) database for Ventura County, California. Available via the Soil Data Mart webpage at http://soildatamart.nrcs.usda.gov/Survey.aspx?State=CA. Publication date 01/03/2008.

Ogden Environmental and Energy Services Co., Inc. 1998. *Biological Conditions Report Santa Susana Field Laboratory, Ventura County, California*. Prepared for Boeing North American, Rocketdyne Propulsion and Power, National Aeronautics and Space Administration, and U.S. Department of Energy.

Padre Associates, Inc. 2008. Biological Resources Study for the Boeing Company Santa Susana Field Laboratory Engineered Natural Treatment Systems (ENTS) Project, Canoga Park, California. Prepared for The Boeing Company. December.

Sawyer, John O., Todd Keeler-Wolf and Julie M. Evans, 2009. *A Manual of California Vegetation*. California Native Plant Society. Sacramento, California.

Science Applications International Corporation (SAIC). 2009. Fall Biological Survey Report for Santa Susana Field Laboratory Area IV and Northern Undeveloped Areas, Denver, Colorado. Prepared for CDM and U.S. Department of Energy. November.

Science Applications International Corporation (SAIC). 2010. California Red-legged Frog Habitat Site Assessment at Santa Susana Field Laboratory Area IV and Vicinity. Prepared for U.S. Fish and Wildlife Service and U.S. Department of Energy. March 25.

University of California. 2011. The Jepson Online Interchange California Floristics. Available at: http://ucjeps.berkeley.edu/interchange.html. October.

U.S. Fish and Wildlife Service (USFWS). 1996. *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants.* Available at: http://www.fws.gov/sacramento/ES/Survey-Protocols-Guidelines/es_survey.htm.

U.S. Fish and Wildlife Service (USFWS), 2011. *Endangered Species Program List of Federal Threatened and Endangered Species for Ventura County, California*. Available at: http://www.fws.gov/endangered/. March.

Western Regional Climate Center (WRCC). 2011. *Climate Summary for Canoga Park, California (041484)*. Available at: http://www.wrcc.dri.edu/. October.

Appendix E, NASA SSFL EI	IS for Proposed Demolition and Environmental Cleanup
--------------------------	--

Appendix A Special-Status Plants Identified in the Database Review Not Expected to Occur on the Site

APPENDIX A

Special-status Plants Identified in the Database Review Not Expected to Occur on the Site

APPENDIX A Special-status Plants Identified in the Database Review Not Expected to Occur on the Site

C : .:		6	Blooming	
Scientific Name	Common Name	Status	Period	Habitat and Notes
Arenaria paludicola	marsh sandwort	FE/CE 1B.1	May-Aug	Sandy openings in marshes and swamps. Only known from two extant occurrences; no herbarium records or California Natural Diversity Data Base (NDDB) occurrences in Ventura County and the occurrence in Los Angeles County has been extirpated.
Astragalus pycnostachyus var. lanosissimus	Ventura marsh milk-vetch	FE/CE 1B.1	June-Oct	Coastal salt marshes, coastal scrub and coastal dunes. No suitable habitat in the study area.
Astragalus tener var. titi	coastal dunes milk-vetch	FE/CE 1B.1	Mar-May	Coastal scrub, coastal prairie and coastal dunes; vernally mesic areas. No suitable habitat in the study area.
Atriplex coulteri	Coulter's saltbush	1B.2	Mar-Oct	Coastal bluff scrub, coastal dunes and coastal grasslands. No suitable habitat in the study area.
Berberis pinnata ssp. insularis	island barberry	FE/CE 1B.2	Feb-May	Endemic to the Channel Islands. Rocky areas in chaparral, coastal scrub, cismontane woodland, and closed cone coniferous forest.
Camissonia lewisii	Lewis' evening-primrose	3	Mar-June	Coastal dunes, coastal scrub, cismontane woodland, and grassland; generally on sandy or clay soils. No herbarium collections from Ventura County; Los Angeles County collections largely occur in coastal plains and basin areas.
Caulanthus californicus	California jewelflower	FE 1B.1	Feb-May	Chenopod scrub, grassland and pinyon-juniper woodland. No CNDDB records of this species in Ventura or Los Angelis Counties. Several herbarium collections from 1935 from the Cuyama Valley near the northwestern part of the County, more than 50 miles from the study area.
Chloropyron maritimum ssp. maritimum	salt marsh bird's-beak	FE/CE 1B.2	May-Oct	Coastal salt marshes and dunes. No suitable habitat in the study area.
Dithyrea maritima	beach spectaclepod	CT 1B.1	Mar-May	Coastal dunes and coastal scrub and other sandy habitat near the shore. No suitable habitat in the study area.

APPENDIX A
Special-status Plants Identified in the Database Review Not Expected to Occur on the Site

NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

			Blooming	
Scientific Name	Common Name	Status	Period	Habitat and Notes
Malacothrix squalida	island malacothrix	FE 1B.1	Apr-July	Endemic to the Channel Islands. Coastal bluff scrub, chaparral and cismontane woodland. Endemic to the Channel Islands.
Orcuttia californica	California Orcutt grass	FE/CE 1B.1	Apr-Aug	Vernal pools and playas; typically in heavy clay soils. No suitable habitat in the study area.
Sidalcea neomexicana	Salt Spring checkerbloom	2.2	Mar-June	Alkali playas, brackish marshes, alkali springs also found in mesic alkaline areas in coastal scrub, chaparral, Mojave desert scrub and lower montane coniferous forests. No suitable habitat in study area.

Status Codes

FE = Federally listed endangered species

CE = State-listed endangered species

CT = State-listed threatened species

1B.1 = California Native Plant Society (CNPS listed as rare, threatened, or endangered in California and elsewhere; considered seriously threatened in California

1B.2 = CNPS listed as rare, threatened, or endangered in California and elsewhere; considered fairly threatened in California

2.2 = CNPS listed as rare, threatened, or endangered in California and elsewhere; but more common elsewhere, considered fairly threatened in California

3 = Plants for which more information is needed; a review list

Sources:

CNDDB Rarefind Version 3.1.0 (CDFG, 2011).

Online CNPS Inventory of Rare and Endangered Plants (8th Edition) (CNPS, 2011)

List of Threatened and Endangered Plants of Ventura County (USFWS, 2011)

Berkeley Consortium of California Herbaria (University of California, 2011)

Rare Plant	Reference	App Site Photo	endix B ographs

Appendix E, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

APPENDIX B

Rare Plant Reference Site Photographs



A-1. Reference Site: *Astragalus brauntonii*. Vegetative; no flowers or buds April 17, 2011.



A-3. Reference Site: *Dudleya cymosa* spp. *agourensis* Flowers. June 7, 2011.



A-2. Reference Site: *Astragalus brauntonii*. Flowering June 8, 2011.



A-4. Reference Site: *Dudleya cymosa* spp. *agourensis*Basal leaves. June 7, 2011.



A-5. Reference Site: *Dudleya cymosa* spp. *marcescens* Flowering. June 7, 2011.



A-7. Reference Site: *Dudleya cymosa* spp. *ovatifolia* Flowering. June 7, 2011.



A-6. Reference Site: *Dudleya cymosa* spp. *marcescens*Basal leaves. June 7, 2011.



A-8. Reference Site: *Dudleya cymosa* spp. *ovatifolia* Flowering. June 7, 2011.

List of Plant Speci	Appendix C es Observed

Appendix E, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

APPENDIX C

List of Plant Species Observed

APPENDIX C

List of Plant Species Observed

Renormalization of the properties of the propert	Scientific Name ¹	Common Name ²	Origin ²	Habit ²
ENNSTAEDTIACEAE teridium aquilinum Western brackenfern N Herb (P) RYOPTERIDACEAE Pryopteris arguta coastal woodfern N Herb (P) OLYPODIACEAE Olypodium californicum California polypody N Herb (P) TERIDACEAE diantum jordanii California maidenhair N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) eLAGINELLACEAE elaginella bigelovii bushy spikemoss N Herb (P) INACEAE Insus muricata ³ Bishop pine N Tree IZOACEAE IZOAC	BLECHNACEAE			
REPORTERIDACEAE RYOPTERIDACEAE RYOPT	Woodwardia fimbriata	giant chainfern	N	Herb (P)
RYOPTERIDACEAE Pryopteris arguta coastal woodfern N Herb (P) DOLYPODIACEAE Dolypodium californicum California polypody N Herb (P) TERIDACEAE diantum jordanii California maidenhair N Herb (P) Elaca andromedifonica California lacefern N Herb (P) Elaca andromedifolia coffee cliffbrake N Herb (P) Entagramma triangularis ssp. triangularis goldenback fern N Herb (P) ELAGINELLACEAE Elaginella bigelovii bushy spikemoss N Herb (P) INACEAE Inus muricata³ Bishop pine N Tree INACEAE Inus muricata³ Bishop pine N Tree INACEAE Inus muricata³ American black elderberry N Shrub/Tree Inambucus nigra ssp. caerulea Inambucus nigra ssp. caerulea Inambucus nigra ssp. caerulea Inambucus mexicanon)* MARANTHACEAE Inamaranthus albus tumbleweed I Herb (A) Inaranathus bilitoides NACEARE Inamaranthus bilitoides NACEARE	DENNSTAEDTIACEAE			
pryopteris arguta coastal woodfern N Herb (P) DOLYPODIACEAE Dolypodium californicum California polypody N Herb (P) TERIDACEAE diantum jordanii California maidenhair N Herb (P) spidotis colifornica California lacefern N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) ELAGINELLACEAE eloginella bigelovii bushy spikemoss N Herb (P) INACEAE Inus muricata³ Bishop pine N Tree IZOACEAE desembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE Inus nigra ssp. caerulea aimbucus nigra ssp. caerulea aimbucus mexicanoj⁵ MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus bilitoides mat amaranth I Herb (A) MACARDIACEAE MACARDIACEAE	Pteridium aquilinum	Western brackenfern	N	Herb (P)
DLYPODIACEAE Dlypodium californicum California polypody N Herb (P) TERIDACEAE diantum jordanii California maidenhair N Herb (P) spidotis californica California lacefern N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) entagramma triangularis ssp. triangularis bushy spikemoss N Herb (P) INACEAE desembryanthemum crystallinum ⁴ bishop pine N Tree IZOACEAE desembryanthemum crystallinum ⁴ common iceplant I Herb (A/P) DOXACEAE desembryanthemum crystallinum ⁴ common iceplant I Herb (A/P) DOXACEAE desembryanthemum crystallinum ⁴ maranthus albus tumbleweed I Herb (A) maranthus albus mat amaranth I Herb (A) MACARDIACEAE	DRYOPTERIDACEAE			
TERIDACEAE TERIDACEAE TERIDACEAE TERIDACEAE TERIDACEAE TO California maidenhair California maidenhair N Herb (P) Spidotis californica California lacefern N Herb (P) Bellaea andromedifolia coffee cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) Bellaea mucronata var. mucronata n Herb (P) Bellaea mucronata var.	Dryopteris arguta	coastal woodfern	N	Herb (P)
TERIDACEAE diantum jordanii California maidenhair N Herb (P) spidotis californica California lacefern N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) entagrinella bigelovii bushy spikemoss N Herb (P) INACEAE Inus muricata Bishop pine N Tree IZOACEAE Idesembryanthemum crystallinum crystallinum common iceplant I Herb (A/P) DOXACEAE Impubucus nigra ssp. caerulea atambucus mexicana) MARANTHACEAE Impubucus maranthus albus tumbleweed I Herb (A) Imparanthus blitoides mat amaranth I Herb (A) IMACARDIACEAE Idesembryanthaceae Impubucus mexicanae Imp	POLYPODIACEAE			
diantum jordanii California maidenhair N Herb (P) spidotis californica California lacefern N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) entagramma triangularis ssp. triangularis bushy spikemoss N Herb (P) ELAGINELLACEAE elaginella bigelovii bushy spikemoss N Herb (P) INACEAE Inus muricata³ Bishop pine N Tree IZOACEAE Elesembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE Inus muricata ssp. caerulea American black elderberry N Shrub/Tree Inambucus migra ssp. caerulea tumbleweed I Herb (A) maranthus albus tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) MARANTHACEAE Idosma laurina laurina laurel sumac N Shrub	Polypodium californicum	California polypody	N	Herb (P)
Spidotis californica California lacefern N Herb (P) ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) entagrinema triangularis ssp. triangularis bushy spikemoss N Herb (P) INACEAE Inus muricata³ Bishop pine N Tree IZOACEAE Idesembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE Inmaranthus aligna ssp. caerulea Inmaranthus alibus Inaceae Inmaranthus alibus Inaceae Inmaranthus alibus Inaceae Inac	PTERIDACEAE			
ellaea andromedifolia coffee cliffbrake N Herb (P) ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) ELAGINELLACEAE elaginella bigelovii bushy spikemoss N Herb (P) INACEAE inus muricata³ Bishop pine N Tree IZOACEAE Idesembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE Immunus muricata ssp. caerulea Immunus migra ssp. caerulea Immunus mexicanoj⁵ MARANTHACEAE Immaranthus albus tumbleweed I Herb (A) Immaranthus blitoides mat amaranth I Herb (A) Immaranthus blitoides	Adiantum jordanii	California maidenhair	N	Herb (P)
ellaea mucronata var. mucronata birdfoot cliffbrake N Herb (P) entagramma triangularis ssp. triangularis goldenback fern N Herb (P) ELAGINELLACEAE elaginella bigelovii bushy spikemoss N Herb (P) INACEAE inus muricata³ Bishop pine N Tree IZOACEAE elesembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE elaginella bigelovii I Herb (A/P) MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus albus mat amaranth I Herb (A) maranthus blitoides N Shrub NACARDIACEAE Idalosma laurina laurina	Aspidotis californica	California lacefern	N	Herb (P)
goldenback fern N Herb (P) ELAGINELLACEAE elaginella bigelovii bushy spikemoss N Herb (P) INACEAE inus muricata³ Bishop pine N Tree IZOACEAE desembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE dambucus nigra ssp. caerulea ambucus mexicana)⁵ MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE dalosma laurina laurina laurel sumac N Shrub	Pellaea andromedifolia	coffee cliffbrake	N	Herb (P)
ELAGINELLACEAE elaginella bigelovii bushy spikemoss N Herb (P) INACEAE inus muricata³ Bishop pine N Tree IZOACEAE desembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE common iceplant I Herb (A/P) DOXACEAE combucus nigra ssp. caerulea ambucus mexicana)⁵ MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE falosma laurina laurina	Pellaea mucronata var. mucronata	birdfoot cliffbrake	N	Herb (P)
bushy spikemoss N Herb (P) INACEAE INUS muricata³ Bishop pine N Tree IZOACEAE Idesembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE Immunicata³ American black elderberry N Shrub/Tree Immunicata³ American black elderberry N Shrub/Tree Immunicata³ Bishop pine N Tree I Herb (A/P) I Herb	Pentagramma triangularis ssp. triangularis	goldenback fern	N	Herb (P)
INACEAE Inus muricata³ Bishop pine N Tree IZOACEAE Idesembryanthemum crystallinum⁴ common iceplant I Herb (A/P) DOXACEAE Immbucus nigra ssp. caerulea Immbucus mexicana)⁵ MARANTHACEAE Immaranthus albus tumbleweed I Herb (A) Immaranthus blitoides maranthus blitoides NACARDIACEAE Idalosma laurina laurel sumac N Shrub	SELAGINELLACEAE			
Bishop pine N Tree IZOACEAE IZOACE	Selaginella bigelovii	bushy spikemoss	N	Herb (P)
IZOACEAE Mesembryanthemum crystallinum ⁴ common iceplant I Herb (A/P) DOXACEAE Immbucus nigra ssp. caerulea cambucus mexicana) ⁵ MARANTHACEAE Imaranthus albus tumbleweed I Herb (A) Imaranthus blitoides mat amaranth I Herb (A) NACARDIACEAE Malosma laurina laurel sumac N Shrub	PINACEAE			
DOXACEAE Tambucus nigra ssp. caerulea sambucus mexicana) ⁵ MARANTHACEAE Tamaranthus albus tumbleweed I Herb (A) MACARDIACEAE Talosma laurina laurina common iceplant I Herb (A) Herb (A/P) Her	Pinus muricata³	Bishop pine	N	Tree
American black elderberry N Shrub/Tree sambucus nigra ssp. caerulea sambucus mexicana) ⁵ MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE dalosma laurina laurel sumac N Shrub	AIZOACEAE			
American black elderberry N Shrub/Tree sambucus mexicana) ⁵ MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE dalosma laurina laurel sumac N Shrub	Mesembryanthemum crystallinum ⁴	common iceplant	1	Herb (A/P)
MARANTHACEAE maranthus albus tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE dalosma laurina laurel sumac N Shrub	ADOXACEAE			
tumbleweed I Herb (A) maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE Malosma laurina laurel sumac N Shrub	Sambucus nigra ssp. caerulea (Sambucus mexicana) ⁵	American black elderberry	N	Shrub/Tree
maranthus blitoides mat amaranth I Herb (A) NACARDIACEAE Ialosma laurina laurel sumac N Shrub	AMARANTHACEAE			
NACARDIACEAE Ialosma laurina laurel sumac N Shrub	Amaranthus albus	tumbleweed	1	Herb (A)
Malosma laurina laurel sumac N Shrub	Amaranthus blitoides	mat amaranth	1	Herb (A)
	ANACARDIACEAE			
hus quata	Malosma laurina	laurel sumac	N	Shrub
nus ovatu sugai sumac in Siliub	Rhus ovata	sugar sumac	N	Shrub

APPENDIX C List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
Schinus molle	Peruvian peppertree	ı	Tree
Toxicodendron diversilobum	Pacific poison oak	N	Shrub
APIACEAE			
Anthriscus caucalis	bur chervil	I	Herb (A)
Bowlesia incana	hairy bowlesia	N	Herb (A)
Daucus pusillus	American wild carrot	N	Herb (A)
Foeniculum vulgare⁴	sweet fennel	I	Herb (B/P)
Lomatium lucidum	shiny biscuitroot	N	Herb (P)
Sanicula bipinnata ⁶	poison sanicle	N	Herb (P)
Sanicula crassicaulis	Pacific blacksnakeroot	N	Herb (P)
Torilis arvensis	spreading hedgeparsley	1	Herb (A)
Yabea microcarpa	false carrot	N	Herb (A)
APOCYNACEAE			
Vinca major	bigleaf periwinkle	I	Vine
ARACEAE			
Lemna sp.	duckweed	N	Herb (P)
ASCLEPIADACEAE			
Asclepias eriocarpa	woollypod milkweed	N	Herb (P)
Asclepias fascicularis	Mexican whorled milkweed	N	Herb (P)
ASTERACEAE			
Acourtia microcephala	sacapellote	N	Herb (P/SS)
Agoseris grandiflora	bigflower agoseris	N	Herb (P)
Artemisia californica	coastal sagebrush	N	Shrub
Artemisia douglasiana	Douglas' sagewort	N	Herb (P)
Baccharis pilularis	coyotebrush	N	Shrub
Baccharis salicifolia	mule-fat	N	Shrub
Carduus pycnocephalus ⁴	Italian plumeless thistle	1	Herb (A)
Centaurea melitensis ⁴	Maltese star-thistle	1	Herb (A/B)
Cirsium occidentale var. occidentale	cobwebby thistle	N	Herb (B)
Cirsium vulgare ⁴	bull thistle	1	Herb (B)
Conyza bonariensis	asthmaweed	1	Herb (A/B)

APPENDIX C
List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
Conyza canadensis	Canadian horeseweed	N	Herb (A/B)
Corethrogyne filaginifolia	common sandaster	N	Herb (P/SS)
Deinandra fasciculata	clustered tarweed	N	Herb (A)
Deinandra minthornii ⁷	Santa Susanna tarweed	N	Shrub
Encelia californica	California brittlebush	N	SS/Shrub
Ericameria pinifolia	pinebush	N	Shrub
Erigeron foliosus	leafy fleabane	N	Herb (P)
Eriophyllum confertiflorum	golden-yarrow	N	SS/Shrub
Gazania linearis ⁴	treasureflower	1	Herb (P)
Hazardia squarrosa var. grindelioides	sawtooth goldenbush	N	SS/Shrub
Heterotheca grandiflora	telegraphweed	N	Herb (A/P)
Hypochaeris glabra	smooth cat's ear	1	Herb (A)
Lactuca serriola	prickly lettuce	1	Herb (A/B)
Lactuca virosa	bitter lettuce	1	Herb (A/B)
Lasthenia californica	California goldfields	N	Herb (A/P)
Logfia filaginoides (syn. Filago californica)	California cottonrose	N	Herb (A)
Logfia gallica (syn. Filago gallica)	narrowleaf cottonrose	1	Herb (A)
Madia gracilis	grassy tarweed	N	Herb (A)
Malacothrix saxatilis	cliff desertdandelion	N	SS/Shrub
Micropus californicus	q-tips	N	Herb (A)
Microseris douglasii	Douglas' silverpuffs	N	Herb (A)
Pseudognaphalium biolettii (Gnaphalium bicolor) ⁵	two-color rabbit-tobacco	N	Herb/SS (B)
Pseudognaphalium californicum	ladies' tobacco	N	Herb/SS (B)
Pseudognaphalium canescens	Wright's cudweed	N	Herb (A/P)
Pseudognaphalium luteoalbum	Jersey cudweed	1	Herb (A)
Psilocarphus tenellus	slender woollyheads	N	Herb (A)
Rafinesquia californica	California plumeseed	N	Herb (A)
Senecio vulgaris	old-man-in-the-Spring	1	Herb (A/B)
Silybum marianum	blessed milkthistle	1	Herb (A/B)
Sonchus asper	spiny sowthistle	1	Herb (A)
Sonchus oleraceus	common sowthistle	1	Herb (A)

APPENDIX C List of Plant Species Observed

			Habit ²
Stephanomeria virgata	rod wirelettuce	N	Herb (A)
Uropappus lindleyi	Lindley's silverpuffs	N	Herb (A)
Venegasia carpesioides	canyon sunflower	N	SS/Shrub
Xanthium strumarium	rough cocklebur	N	Herb (A)
BORAGINACEAE			
Amsinckia intermedia	common fiddleneck	N	Herb (A)
Amsinckia menziesii	Menzies' fiddleneck	N	Herb (A)
Cryptantha sp. (cf C. barbigera)	cryptantha	N	Herb (A)
Cryptantha muricata	Clokey's cryptantha	N	Herb (A)
Cryptantha micromeres	pygmyflower cryptantha	N	Herb (A)
Emmenanthe penduliflora	whisperingbells	N	Herb (A)
Eriodictyon crassifolium	thickleaf yerba santa	N	Shrub
Eucrypta chrysanthemifolia	spotted hideseed	N	Herb (A)
Pectocarya linearis	sagebrush combseed	N	Herb (A)
Phacelia cicutaria	caterpillar phacelia	N	Herb (A)
Phacelia minor	wild Canterbury bells	N	Herb (A)
Phacelia ramosissima	branching phacelia	N	Herb/SS (P)
Phacelia tanacetifolia	lacy phacelia	N	Herb (A)
Plagiobothrys nothofulvus	rusty popcornflower	N	Herb (A)
BRASSICACEAE			
Arabis sparsiflora	sicklepod rockcress	N	Herb/SS (P)
Brassica nigra ⁴	black mustard	1	Herb (A)
Draba cuneifolia	wedgeleaf draba	N	Herb (A)
Lepidium nitidum var. nitidum	shining pepperweed	N	Herb (A)
Sisymbrium orientale	Indian hedgemustard	1	Herb (A)
Thysanocarpus laciniatus	mountain fringepod	N	Herb (A)
CACTACEAE			
Opuntia ficus-indica³	Barbary fig	I	Shrub
CALLITRICHACEAE			
Callitriche marginata	winged water-starwort	N	Herb (A)

APPENDIX C List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
CAMPANULACEAE			
Triodanis perfoliata	clasping Venus' looking-glass	N	Herb (A)
CAPRIFOLIACEAE			
Lonicera subspicata	southern honeysuckle	N	Shrub/Vine
Symphoricarpos mollis	creeping snowberry	N	SS/Shrub
CARYOPHYLLACEAE			
Cerastium glomeratum	sticky chickweed	I	Herb (A)
Minuartia douglasii	Douglas' stitchwort	Н	Herb (A)
Polycarpon tetraphyllum	fourleaf manyseed	1	Herb (A/P)
Silene antirrhina	sleepy silene	N	Herb (A)
Silene gallica	common catchfly	1	Herb (A/B)
Silene laciniata	cardinal catchfly	N	Herb (P)
Stellaria media	common chickweed	N	Herb (A/P)
CHENOPODIACEAE			
Chenopodium californicum	California goosefoot	N	Herb (P)
Dysphania ambrosioides	Mexican tea	1	Herb (A/P)
Salsola tragus ⁴	prickly Russian thistle	1	Herb (A)
CISTACEAE			
Helianthemum scoparium	Bisbee Peak rushrose	N	SS/Shrub
CONVOLVULACEAE			
Calystegia macrostegia ssp. cyclostegia	island false bindweed	N	Herb/Vine
Convolvulus arvensis	field bindweed	1	Herb/Vine
Cuscuta californica	chaparral dodder	N	Herb/Vine
CRASSULACEAE			
Crassula aquatica	water pygmyweed	N	Herb (A)
Crassula connata	sand pygmyweed	N	Herb (A)
Dudleya lanceolata	lanceleaf liveforever	N	Herb (P)
Dudleya pulverulenta	chalk dudleya	N	Herb (P)
CUCURBITACEAE			
Marah macrocarpus	Cucamonga manroot	N	Herb/Vine

APPENDIX C List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
ERICACEAE			
Arctostaphylos glauca	bigberry manzanita	N	Shrub
EUPHORBIACEAE			
Chamaesyce maculata	spotted sandmat	I ⁸	Herb (A)
Chamaesyce polycarpa	smallseed sandmat	N	Herb (A/P)
Croton setigerus	dove weed	N	Herb (A)
FABACEAE			
Acmispon americanus (syn. Lotus purshianus)	birds-foot trefoil	N	Herb (A)
Acmispon argophyllus (syn. Lotus argophyllus)	silver bird's-foot trefoil	N	Herb/SS (P)
Acmispon glaber (syn. Lotus scoparius)	common deerweed	N	SS (P)
Acmispon strigosus (syn. Lotus strigosus)	strigose bird's-foot trefoil	N	Herb (A)
Lupinus bicolor	miniature lupine	N	Herb (A)
Lupinus hirsutissimus	stinging annual lupine	N	Herb (A)
Lupinus truncatus	collared annual lupine	N	Herb (A)
Medicago polymorpha	burclover	1	Herb (A/P)
Melilotus indicus	annual yellow sweetclover	I	Herb (A)
Trifolium gracilentum	pinpoint clover	N	Herb (A)
Trifolium willdenovii	tomcat clover	N	Herb (A)
Vicia hassei	Hasse's vetch	N	Herb (A)
Vicia villosa	winter vetch	I	Herb (A/P)
FAGACEAE			
Quercus agrifolia	California live oak	N	Tree/Shrub
Quercus berberidifolia	scrub oak	N	Tree/Shrub
GENTIANACEAE			
Zeltnera venusta (syn. Centaurium venustum)	charming centaury	Н	Herb (A)
GERANIACEAE			
Erodium botrys	longbeak stork's bill	1	Herb (A/B)
Erodium cicutarium	redstem stork's bill	1	Herb (A/B)
Geranium sp. ³	cultivated geranium	I	Herb (P)

APPENDIX C
List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
GROSSULARIACEAE			
Ribes malvaceum	chaparral current	N	Shrub
Ribes speciosum	fuchsiaflower gooseberry	N	Shrub
JUGLANDACEAE			
Juglans californica	Southern California walnut	N	Tree/Shrub
LAMIACEAE			
Marrubium vulgare	horehound	I	Herb/SS (P)
Salvia columbariae	chia	N	Herb (A)
Salvia leucophylla	San Luis purple sage	N	SS/Shrub
Salvia mellifera	black sage	N	SS/Shrub
Salvia spathacea	hummingbird sage	N	Herb (P)
Scutellaria tuberosa	Danny's skullcap	N	Herb (P)
Stachys bullata	California hedgenettle	N	Herb (P)
Trichostema lanatum	woolly bluecurls	N	SS/Shrub
Trichostema lanceolatum	vinegarweed	N	Herb (A)
LAURACEAE			
Umbellularia californica	California laurel	N	Tree/Shrub
LYTHRACEAE			
Lythrum hyssopifolia	hyssop loosestrife	1	Herb (A/B)
MALVACEAE			
Malacothamnus fasciculatus	Mendocino bushmallow	N	SS/Shrub
Sidalcea malviflora	dwarf checkerbloom	N	Herb/SS (P)
MONTIACEAE			
Claytonia perfoliata	miner's lettuce	N	Herb (A/P)
MYRSINACEAE			
Anagallis arvensis	scarlet pimpernel	I	Herb (A/B)
NYCTAGINACEAE			
Mirabilis laevis var. crassifolia (syn. Mirabilis californica)	California four o'clock	N	SS (P)
OLEACEAE			
Fraxinus velutina³	velvet ash	N	Tree

APPENDIX C List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
ONAGRACEAE			
Camissonia bistorta	southern suncup	N	Herb (A/P)
Camissonia californica	California suncup	N	Herb (A/P)
Camissonia hirtella	Santa Cruz Island suncup	N	Herb (A)
Camissonia micrantha	miniature suncup	N	Herb (A)
Clarkia purpurea	winecup clarkia	N	Herb (A)
Clarkia unguiculata	elegant clarkia	N	Herb (A)
Epilobium sp.	willowherb	N	Herb (A)
PAEONIACEAE			
Paeonia californica	California peony	N	Herb (P)
PAPAVERACEAE			
Dendromecon rigida	tree poppy	N	Shrub/Tree
Eschscholzia californica	California poppy	N	Herb (A/P)
Platystemon californicus	creamcups	N	Herb (A)
PHRYMACEAE			
Mimulus aurantiacus	orange bush monkeyflower	N	Shrub/SS
Mimulus brevipes	widethroat yellow monkeyflower	N	Herb (A)
Mimulus floribundus	manyflowered monkeyflower	N	Herb (A)
Mimulus guttatus	seep monkeyflower	N	Herb (A/P)
Mimulus pilosus	false monkeyflower	Н	Herb (A)
PLANTAGINACEAE			
Antirrhinum coulterianum	Coulter's snapdragon	N	Herb (A)
Antirrhinum kelloggii	Kellogg snapdragon	N	Herb (A)
Antirrhinum multiflorum	Sierra snapdragon	N	Herb/SS (A)
Collinsia parryi	Parry's blue eyed Mary	N	Herb (A)
Keckiella cordifolia	heartleaf Keckiella	N	Shrub/SS
Penstemon centranthifolius	scarlet bugler	N	H/SS (P)
Penstemon spectabilis	showy penstemon	N	H/SS (P)
Plantago erecta	dotseed plantain	N	Herb (A)
Veronica peregrina	neckweed	N	Herb (A)

APPENDIX C List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
PLATANACEAE			
Platanus racemosa	California sycamore	N	Tree
POLEMONIACEAE			
Allophyllum divaricatum	purple false gilyflower	N	Herb (A)
Allophyllum glutinosum	sticky false gilyflower	N	Herb (A)
Eriastrum sapphirinum	sapphire woollystar	N	Herb (A)
Linanthus californicus (syn. Leptodactylon californicum)	California prickly phlox	N	Herb/SS (P)
Linanthus dianthiflorus	fringed linanthus	N	Herb (A)
Navarretia hamata	hooked pincushionplant	N	Herb (A)
POLYGONACEAE			
Chorizanthe staticoides	Turkish rugging	N	Herb (A)
Eriogonum elongatum	longstem buckwheat	N	SS/Herb (P)
Eriogonum fasciculatum var. fasciculatum	Eastern Mojave buckwheat	N	SS/Shrub
Eriogonum wrightii var. membranaceum	bastardsage	N	SS/Shrub
Persicaria cf hydropiperoides (syn. Polygonum hydropiperoides)	swamp smartweed	N	Herb (P)
Pterostegia drymarioides	woodland pterostegia	N	Herb (A)
Rumex crispus	curly dock	1	Herb (P)
Rumex salicifolius	willow dock	N	Herb (P)
PRIMULACEAE			
Dodecatheon clevelandii	padre's shootingstar	N	Herb (P)
RANUNCULACEAE			
Delphinium cardinale	scarlet larkspur	N	Herb (P)
Delphinium parryi	San Bernardino larkspur	N	Herb (P)
RHAMNACEAE			
Ceanothus crassifolius	hoaryleaf ceanothus	N	Shrub
Ceanothus oliganthus	hairy ceanothus	N	Shrub
Ceanothus spinosus	redheart	N	Shrub
Rhamnus ilicifolia	hollyleaf redberry	N	Shrub

APPENDIX C List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
ROSACEAE			
Adenostoma fasciculatum	chamise	N	Shrub
Cercocarpus betuloides	birchleaf mountain mahogany	N	Shrub/Tree
Hertermeles arbutifolia	toyon	N	Shrub
Drymocallis glandulosa (syn. Potentilla glandulosa)	sticky cinquefoil	N	SS/Herb (P)
Prunus dulcis ³	sweet almond	1	Tree
Prunus ilicifolia	hollyleaf cherry	N	Tree/Shrub
Rosa californica	California wildrose	N	Shrub
Rubus ursinus	California blackberry	N	SS (P)
RUBIACEAE			
Galium angustifolium	narrowleaf bedstraw	N	Herb/SS (P)
Galium aparine	stickywilly	N	Herb (A)
Galium cliftonsmithii	Santa Barbara bedstraw	N	Shrub
Galium nuttallii	climbing bedstraw	N	SS/Shrub
Galium parisiense	wall bedstraw	1	Herb (A)
SALICACEAE			
Populus fremontii	Fremont cottonwood	N	Tree
Salix exigua	narrowleaf willow	N	Shrub/Tree
Salix laevigata	red willow	N	Tree
Salix lasiolepis	arroyo willow	N	Tree/Shrub
SAXIFRAGACEAE			
Lithophragma affine	San Francisco woodland-star	N	Herb (P)
SCROPHULARIACEAE			
Scrophularia californica	California figwort	N	Herb (P)
SIMAROUBACEAE			
Ailanthus altissima ⁴	tree of heaven	I	Tree
SOLANACEAE			
Datura wrightii	sacred thorn-apple	N	Herb (A/P)
Nicotiana glauca	tree tobacco	1	Shrub/Tree
Solanum douglasii	greenspot nightshade	N	Herb (P)
Solanum xanti	chaparral nightshade	N	Herb (P)

APPENDIX C List of Plant Species Observed

NASA SSFL2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory	NASA SSFL2011	Supplemental Biologic	al Survevs of N	IASA-Administered Propert	tv at Santa Susana Field Laboratorv
--	---------------	-----------------------	-----------------	---------------------------	-------------------------------------

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
URTICACEAE			
Hesperocnide tenella	western stingingnettle	N	Herb (A)
Parietaria hespera	rillita pellitory	N	Herb (A/P)
Urtica urens	dwarf nettle	1	Herb (A)
VERBENACEAE			
Verbena lasiostachys	western vervain	N	Herb (P)
AGAVACEAE			
Chlorogalum pomeridianum	wavyleaf soap plant	N	Herb (P)
Yucca gloriosa ³	moundlily yucca	1	Tree/Shrub
Yucca whipplei	chaparral yucca	N	SS/Shrub
ARECACEAE			
Phoenix sp. ³	date palm	I	Tree
Washingtonia robusta	Washington fan palm	1	Tree
CYPERACEAE			
Cyperus eragrostis	tall flatsedge	N	Graminoid (P)
Eleocharis macrostachya	pale spikerush	N	Graminoid (P)
IRIDACEAE			
Sisyrinchium bellum	western blue-eyed grass	N	Herb (P)
JUNCACEAE			
Juncus balticus	mountain rush	N	Graminoid (P)
Juncus bufonius	toad rush	N	Graminoid (A)
Juncus phaeocephalus	brownhead rush	N	Graminoid (P)
Juncus xiphioides	irisleaf rush	N	Graminoid (P)
LILIACEAE			
Calochortus plummerae ⁷	Plummer's mariposa lily	N	Herb (P)
Calochortus clavatus var. gracilis ⁷	slender mariposa lily	N	Herb (P)
MELANTHIACEAE			
Toxicoscordion fremontii (syn. Zigadenus fremontii)	Fremont's deathcamas	N	Herb (P)
POACEAE			
Agrostis pallens	seashore bentgrass	N	Graminoid (P)
Avena barbata	slender oat	1	Graminoid (A)

APPENDIX C
List of Plant Species Observed

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
Avena fatua	wild oat	I	Graminoid (A)
Bromus carinatus	California brome	N	Graminoid (A/P)
Bromus diandrus ⁴	ripgut brome	1	Graminoid (A)
Bromus hordeaceus	soft brome	1	Graminoid (A)
Bromus madritensis ssp. rubens ⁴	red brome	1	Graminoid (A)
Bromus sterilis	poverty brome	1	Graminoid (A)
Chloris virgata	feather fingergrass	I ⁸	Graminoid (A)
Cynodon dactylon	Bermudagrass	1	Graminoid (P)
Elymus glaucus	blue wildrye	N	Graminoid (P)
Gastridium ventricosum	nit grass	I	Graminoid (A)
Hordeum murinum ssp. leporinum	hare barley	I	Graminoid (A)
Lamarckia aurea	goldentop grass	1	Graminoid (A)
Leymus condensatus	giant ryegrass	N	Graminoid (P)
Melica imperfecta	smallflower melicgrass	N	Graminoid (P)
Muhlenbergia microsperma	littleseed muhly	N	Graminoid (A)
Muhlenbergia rigens	deergrass	N	Graminoid (P)
Nassella lepida	foothill needlegrass	N	Graminoid (P)
Nassella pulchra	purple needlegrass	N	Graminoid (P)
Pennisetum setaceum ⁴	crimson fountaingrass	1	Graminoid (P)
Piptatherum miliaceum	smilograss	1	Graminoid (P)
Poa annua	annual bluegrass	1	Graminoid (A)
Poa pratensis	Kentucky bluegrass	1	Graminoid (P)
Poa secunda	Sandberg bluegrass	N	Graminoid (P)
Polypogon monspeliensis	annual rabbitsfoot grass	1	Graminoid (A)
Schismus arabicus	Arabian schismus	1	Graminoid (A)
Vulpia bromoides	brome fescue	1	Graminoid (A)
Vulpia microstachys	small fescue	N	Graminoid (A)
Vulpia myuros ssp. myuros ⁴	rat-tail fescue	1	Graminoid (A)

APPENDIX C

List of Plant Species Observed

NASA SSFL2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Scientific Name ¹	Common Name ²	Origin ²	Habit ²
THEMIDACEAE			
Dichelostemma capitatum	bluedicks	N	Herb (P)
ТҮРНАСЕАЕ			
Typha domingensis	southern cattail	N	Herb (P)

Notes:

N = Native

I = Introduced (non-native species that have become naturalized)

(A) = Annual

(B) = Biennial

(P) = Perennial

SS = Sub-Shrub

¹Taxonomy follows the currently accepted nomenclature for plant species occurring in California as indicated on the Jepson On-Line Interchange for California Floristics (University of California, 2011).

²Species common name, origin and grow habitat from the U.S. Department of Agriculture's Plants Database (2011).

³ Horticultural or landscape planting

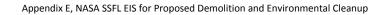
⁴Noxious or invasive weed

⁵Taxonomic or nomenclatural synonym for taxon not occurring in California.

 $^{^{\}rm 6}$ Species was observed just outside of the NASA-administered property by Tarja Sagar.

⁷Special-status plant species

⁸ Considered Native in the USDA Plants Databases, but is considered an introduced (naturalized) species in California, per the Jepson On-Line Interchange.



Appendix E, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup	

Appendix D Representative Photographs of the Site, Specialstatus Plants, and Wildlife Species

APPENDIX D

Representative Photographs of the Site, Special-status Plants, and Wildlife Species



B-1 Santa Susana tarplant (Deinandra minthornii)—August 18, 2011



B-3 Plummer's mariposa lily (*Calochortus plummerae*)— June 27, 2011



B-2 Santa Susana tarplant (Deinandra minthornii)—August 18, 2011



B-4 Plummer's mariposa lily (*Calochortus plummerae*)— June 27, 2011



B-5 View northeast of southern willow scrub in Alfa Area-April 2011



B-7 Coast horned lizard (*Phrynosoma blainvillii*), Area I–April 2011



B-6 Woodrat (*Neotoma* sp.) nest— April 2011



B-8 Two striped garter snake (*Thamnophis hammondii*),
Area 1–April 2011



B-9 Stick nest in sandstone cliff-April 2011



B-10 Dead canyon bat (*Parastrellus hesperus*), Area II Alfa Site—August 2011



B-10 Red-tailed hawk (*Buteo jamaicensis*) nest— April 2011



B-11 Western side-blotched lizard (*Uta stansburiana elegans*)—
April 2011



B-12 Western rattlesnake (*Crotalus oreganus helleri*), on roadway near the SPA Area–June 2011



B-14 Square-spotted blue (*Euphilotes battoides*)—
June 2011

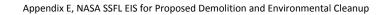


B-13 California Striped Racer (Masticophis lateralis lateralis)— August 2011



B-15 Lorquin's admiral (*Limenitis lorquini*)—
April 2011

	Appendix E, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup			
			_	
			App	endix E
Wil	dlife Species	Observed	in 2010 a	nd 2011
	-			



APPENDIX E

Wildlife Species Observed in 2010 and 2011

APPENDIX E Wildlife Species Observed in 2010 and 2011

NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Common Name	Scientific Name	2010	2011
Butterflies			
Quino Checkerspot ^{1,2}	Euphydryas editha quino	Х	
Anise Swallowtail	Papilio zelacaon		Х
Western Tiger Swallowtail	Papilio rutulus		Х
Checkered White	Pontia protodice		Х
Cabbage White	Pieres rapae		Х
Orange Sulphur	Colius curytheme		Х
Square-spotted Blue	Euphilotes battoides		Х
American Lady	Vanessa virginiensis		Х
Lorquin's Admiral	Limenitis lorquini		Х
Funereal Duskywing	Erynnis funeralis		Х
Northern White-skipper	Heliopetes ericetorum		Х
Herpetiles			
Northern Pacific Treefrog	Pseudacris regilla		Х
Western Toad	Anaxyrus [Bufo] boreas	X	
Coast Horned Lizard ³	Phrynosoma blainvillii	Х	Х
Western Fence Lizard	Sceloporus occidentalis	Χ	Х
California Whiptail	Aspidoscelis tigris munda	Х	Х
Mountain Garter Snake	Thamnophis elegans elegans	X	
Two-striped Garter Snake ³	Thamnophis hammondii		Х
Ring-necked Snake	Diadophis punctatus	Χ	Х
California Striped Racer	Coluber [=Masticophis] lateralis lateralis		Х
Gopher Snake	Pituophis catenifer		Х
Western Rattlesnake	Crotalus oreganus helleri	Χ	х
Birds			
Mallard	Anas platyrhynchos	Х	Х
California Quail	Callipepla californica	x	Х

APPENDIX E
Wildlife Species Observed in 2010 and 2011

NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Common Name	Scientific Name	2010	2011
Great Blue Heron	Ardea herodias	Х	Х
Green Heron	Butorides virescens	X	Χ
Turkey Vulture	Cathartes aura	Х	Х
Cooper's Hawk	Accipiter cooperii	X	Χ
Red-shouldered Hawk	Buteo lineatus	X	Χ
Red-tailed Hawk	Buteo jamaicensis	X	Χ
Ferruginous Hawk	Buteo regalis		Χ
American Kestrel	Falco sparverius	X	Х
Rock Pigeon	Columba livia	X	Χ
Band-tailed Pigeon	Patagioenas fasciata	X	Χ
Mourning Dove	Zenaida macroura	X	Χ
Greater Roadrunner	Geococcyx californianus		Χ
Barn Owl	Tyto alba		Χ
Great Horned Owl	Bubo virginianus		Χ
White-throated Swift	Aeronautes saxatalis	X	Χ
Black-chinned Hummingbird	Archilochus alexandri	X	Χ
Anna's Hummingbird	Calypte anna	X	Χ
Rufous/Allen's Hummingbird	Selasphorus rufus/sasin	X	Χ
Belted Kingfisher	Megaceryle alcyon	X	Χ
Acorn Woodpecker	Melanerpes formicivorus	X	Χ
Nuttall's Woodpecker	Picoides nuttallii	X	Х
Northern Flicker	Colaptes auratus	X	Х
Black Phoebe	Sayornis nigricans	X	Х
Say's Phoebe	Sayornis saya	X	Χ
Western Kingbird	Tyrannus verticalis		Χ
Loggerhead Shrike ³	Lanius Iudovicianus	X	Χ
Least Bell's Vireo ²	Vireo bellii pusillus		Χ
Cassin's Vireo	Vireo cassinii	X	Χ
Western Scrub-Jay	Aphelocoma californica	Χ	Χ
American Crow	Corvus brachyrhynchos	Χ	Χ
Common Raven	Corvus corax	Χ	X

APPENDIX E
Wildlife Species Observed in 2010 and 2011
NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

Common Name	Scientific Name	2010	2011
Oak Titmouse	Baeolophus inornatus	Х	Х
Red-winged Blackbird	Agelaius phoeniceus		Х
Bushtit	Psaltriparus minimus	X	Х
White-breasted Nuthatch	Sitta carolinensis	X	Х
Pygmy Nuthatch	Sitta pygmaea	X	Х
Rock Wren	Salpinctes obsoletus	X	Х
Canyon Wren	Catherpes mexicanus	X	Х
Bewick's Wren	Thryomanes bewickii	X	Х
House Wren	Troglodytes aedon	X	Х
Wrentit	Chamaea fasciata	X	Х
Northern Mockingbird	Mimus polyglottos	X	X
California Thrasher	Toxostoma redivivum	X	Х
Orange-crowned Warbler	Vermivora celata	X	Х
Yellow-rumped Warbler	Dendroica coronata	X	Х
MacGillivray's Warbler	Oporornis tolmiei	X	Х
Wilson's Warbler	Wilsonia pusilla	X	Х
Spotted Towhee	Pipilo maculatus	X	Х
California Towhee	Melozone crissalis	Х	Х
Song Sparrow	Melospiza melodia		Х
Rufous-crowned Sparrow	Aimophila ruficeps	X	Х
Lark Sparrow	Chondestes grammacus	X	Х
Fox Sparrow	Passerella iliaca	Х	Х
Lincoln's Sparrow	Melospiza lincolnii	Х	Х
White-crowned Sparrow	Zonotrichia leucophrys	X	Х
Blue Grosbeak	Passerina caerulea		Х
House Finch	Carpodacus mexicanus	X	X
American Goldfinch	Spinus tristis	Х	X
Mammals			
Canyon Bat	Parastrellus hesperus		Х
Botta's Pocket Gopher	Thomomys bottae		X
Desert Cottontail	Sylvilagus audubonii	X	Х

APPENDIX E Wildlife Species Observed in 2010 and 2011

NASA SSFL 2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory

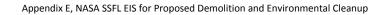
Common Name	Scientific Name	2010	2011
Woodrat	Neotoma sp.		X
California Ground Squirrel	Spermophilus beecheyi	Χ	Χ
Ring-tailed cat ⁴	Bassariscus astutus	Χ	
Raccoon	Procyon lotor	Χ	Χ
Coyote	Canis latrans	Χ	X
Bobcat	Felis rufus	Χ	X
Mountain Lion	Felis concolor	Χ	X
California Mule Deer	Odocoileus hemionus californicus	Χ	Х
Wild Pig	Sus scrofa	Χ	Х
Gray fox	Urocyon cinereoargenteus		Х
Vole species	Microtus sp.	Χ	Χ
Mouse species	Rodentia		Χ

Notes:

¹ Tentative species identification ² Federally listed endangered species ³ California Species of Concern

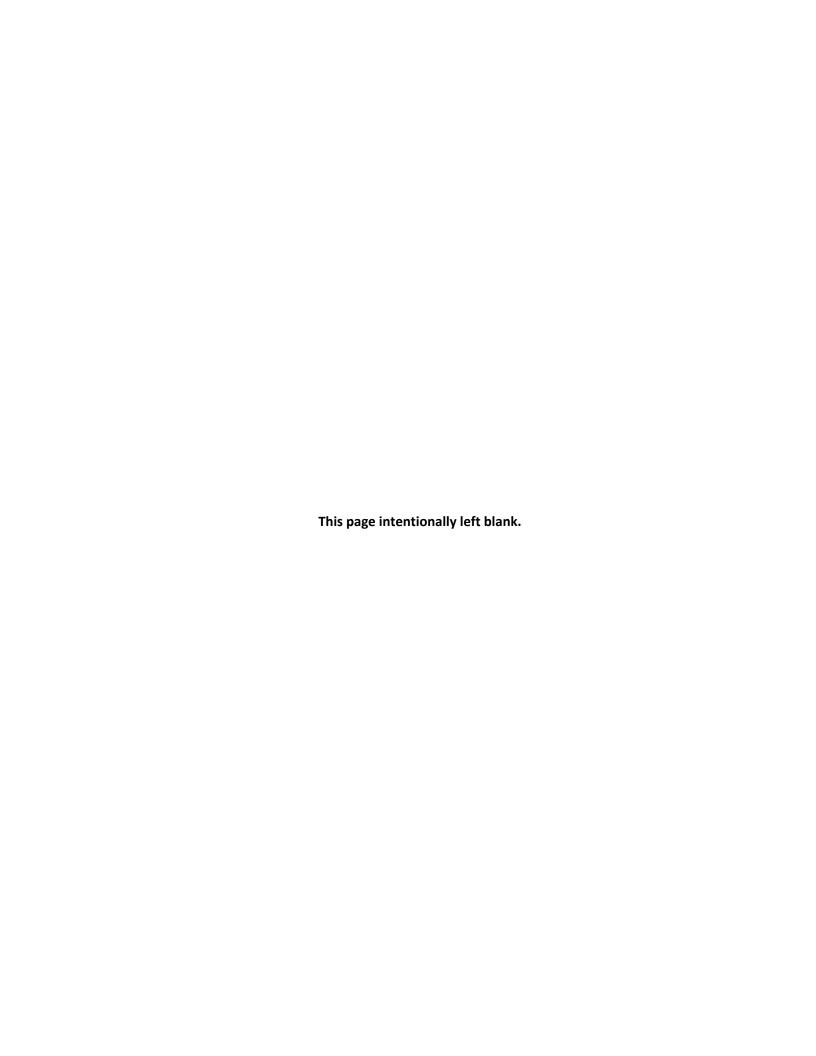
⁴ California Fully Protected Species

End of Appendix E



APPENDIX F

Quino Checkerspot Butterfly Habitat Survey for NASA-Administered Property at Santa Susana Field Laboratory



HABITAT ASSESSMENT FOR THE ENDANGERED QUINO CHECKERSPOT BUTTERFLY AT THE NASA-ADMINISTERED AREAS I AND II OF THE SANTA SUSANA FIELD LABORATORY

Prepared for:

CH2M Hill, Inc. 155 Grand Avenue, Suite 800 Oakland, CA 94612

PO #945273

Prepared by:

Richard A. Arnold, Ph.D.
Entomological Consulting Services, Ltd.
104 Mountain View Court
Pleasant Hill, CA 94523-2188

Final Report: April 2012

INTRODUCTION

CH2M Hill, Inc. is assisting the National Aeronautics and Space Administration (NASA) in the preparation of a Natural Resources Management Plan for NASA-administered portions of the Santa Susana Field Laboratory (SSFL). The 2,850-acre SSFL property is located in the hills between Simi Valley and Woodland Hills in eastern Ventura County, CA.

One of the sensitive resources that might possibly occur at the SSFL is the federally endangered Quino Checkerspot butterfly (*Euphydryas editha quino*, Lepidoptera: Nymphalidae). Entomological Consulting Services, Ltd. was hired to assist CH2M Hill in the evaluation of existing habitat conditions to support the Quino Checkerspot in two NASA-administered portions of the SSFL; 41.7 acres within Area I and all 409.5 acres of Area II. Several small additional sectors of SSFL that total 43 acres and border Areas I and II were also included in this habitat assessment survey for the endangered butterfly. All surveyed portions of the SSFL for this habitat assessment are illustrated in Figure 1, an aerial photograph of the site, while Figure 2 illustrates the boundaries of the surveyed areas on the Calabasas topographic map (US Geological Survey 7.5' series).

The remainder of this report provides pertinent background information on the Quino Checkerspot butterfly and the habitats that occur at the SSFL property. It also describes our survey methods and the findings from our habitat assessment survey.

BACKGROUND INFORMATION

Conservation Status.

The Quino Checkerspot butterfly, *Euphydryas editha quino* (Behr) 1863, was listed as an endangered species in late 1990's by the US Fish & Wildlife Service (1997). The primary threats that led to its recognition as an endangered species were loss and degradation of its habitats, fragmentation of remaining occupied sites, lack of connectivity between remaining occupied sites, and adverse impacts due to fire management practices.

The butterfly is not recognized as endangered by the State of California. The state's Fish and Game Code specifically excludes insects as a type of animal that can be recognized as endangered under the state's endangered species statute.

A recovery plan was prepared by the US Fish & Wildlife Service (2003). Ten units of critical habitat, including seven in Riverside County and three in San Diego County, have been recognized (US Fish & Wildlife Service 2009).

Distribution.

Historically, the Quino Checkerspot occurred primarily in Los Angeles, Orange, San Bernardino, Riverside and San Diego counties of California. It was also found in the northwestern part of Baja California, Mexico. Today, all of the currently known locations that still support the Quino Checkerspot are in Riverside and San Diego counties (US Fish & Wildlife Service 2003, 2009).

Based on a review of literature, museum collection records, and findings of recent surveys (BUGGY Data Base, 2012; California Natural Diversity Data Base, 2012), I could not find any bona fide records for Ventura County. Nonetheless, due to the SSFL's location near the Ventura-Los Angeles County border, and restricted access at this property for many decades, it is certainly plausible that the butterfly might be found there if suitable habitat conditions were present.

Natural History.

The Quino Checkerspot is usually associated with openings in scrub, coastal sage scrub, chaparral, oak woodland, and grassland plant communities, especially openings that are characterized by native bunch grasses and forbs. The primary oviposition and larval food plant is Dwarf (also sometimes referred to as "Erect") Plantain (*Plantago erecta*, Plantaginaceae). Larvae occasionally have also been observed feeding on Purple Owl's Clover (*Castilleja exserta*, Orabanchaceae), Rigid Bird's Beak (*Cordylanthus rigidus*, Orabanchaceae), White Snapdragon (*Antirrhinum coulterianum*, Plantaginaceae), and Southern Chinese Houses (*Collinsia concolor*, Plantaginaceae) (Pratt and Emmel 2010).

The sequence of life history events for the Quino Checkerspot can be described as follows. The butterfly is univoltine, i.e., it has one generation per year. There are four stages in the butterfly's life cycle: egg, larva (i.e., caterpillar), pupa, and adult. Its adult flight season is typically about six to eight weeks in length, usually starting in early February and terminating in April. Actual starting and ending times can vary by several weeks between years, as well as the length of the flight season. Individual adults live approximately one to two weeks, during which time they must mate and reproduce. Adults obtain energy and nutrients from the nectar of various native, annual wild flowers, including: *Lasthenia*, *Cryptantha*, *Gilia*, and *Linanthus*, but will occasionally utilize flowers of other plants to obtain nectar.

Mate location occurs primarily on hilltops, where both sexes congregate after eclosion (i.e., adult emergence from the pupa). Upon mating, females disperse throughout the hilltops and downslope from the hilltops to lay their eggs. The eggs are generally laid is masses near the base of *Plantago erecta* plants.

Larvae hatch in about 10-14 days and feed for approximately another 2-4 weeks until their food plants senesce or are defoliated. Young larvae, which have limited mobility at this stage, frequently fail to find sufficient edible food plants and starve. Typically, 90% or more of these young larvae starve to death. As its annual food plant senesces, the partially grown larvae enter a physiological dormant period, known as diapause, which is spent under rocks or in cracks and crevices in the soil to survive the dry season when there is no food for the larvae. The dry season diapause ends with the onset of the next rainy season and the germination of *Plantago erecta*. Post-diapause larvae resume feeding at that time. Because the larvae are cold-blooded, their activity is limited to warm days in the winter. Thus, they especially favor open-canopy areas where sunlight can hit the ground to help them warm up and remain active. After periodic feeding for several weeks they complete their development by pupating. The pupal stage generally lasts about 2 weeks before emergence of the adult butterfly.

Habitats at Areas I and II of SSFL.

A variety of habitat types occur within 41.7-acre study site of Area I and the 409.5-acre Area II at SSFL. These were identified and mapped by CH2M Hill, Inc. during the fall of 2010 (NASA 2011). The habitat types and their approximate acreages (NASA 2010) include:

- a) Baccharis Scrub (2.6 acres);
- b) Chaparral (172.6 acres);
- c) Coast Live Oak Riparian Forest (9.2 acres);
- d) Coast Live Oak Woodland (13.2 acres);
- e) Freshwater Marsh (0.2 acre);
- f) Mulefat Scrub (2.1 acres);
- g) Non-native Grassland (18.6 acres);
- h) Venturan Coastal Sage Scrub (64.4 acres);
- i) Southern Willow Scrub (1.0 acre);
- j) Undifferentiated Wetland (0.6 acre);
- k) Developed, i.e., buildings, paved roads, parking lots, etc. (58.1 acres);
- 1) Open water, i.e., stormwater detention basins (0.4 acre);
- m) Rock Outcrops (84.5 acres); and
- n) Ruderal (16.8 acres).

Figure 3 illustrates the locations of these habitat types within our study areas at the SSFL.

HABITAT ASSESSMENT METHODS

CH2M Hill, Inc. provided several background materials that were reviewed before our first site visit. These items included reports, maps, and aerial photographs of the study areas, as well as GIS shapefiles for the boundaries of the study areas. The GIS shapefiles, depicting the boundaries of our study areas I and II were loaded into two mapping-grade GPS units manufactured by Trimble to guide our field surveys.

Dr. Robert B. Jensen and I initially visited the SSFL on 18 July 2011 to familiarize ourselves with the property and study areas. Although we had originally intended to survey for dried specimens of *Plantago erecta*, we did not see any remnant individuals of this or other larval food plants and decided to postpone our habitat assessment until the spring of 2012 when the food plants would be more apparent.

Our return field visits occurred between March 5 and 7, 2012. We selected these survey dates because local colleagues indicated that *Plantago erecta* was blooming at other locations. Upon our arrival, Randy Dean of CH2M Hill, Inc., took us to a known location at the SSFL property (but outside of our habitat assessment survey area) where *Plantago erecta* had previously been observed (Faulkner 2010). We confirmed the presence of the food plant, which was in full flower. We then returned to Areas I and II to conduct our habitat assessment surveys.

Initially we drove all of the existing roads within or adjacent to both study areas to determine where there was unsuitable habitat and where there was potentially suitable habitat that might support the butterfly and its food plants that required more intensive searches for the food plants. Unsuitable habitat was characterized by developed areas (i.e., buildings and other

facilities), hardscape (i.e., paved roads, parking lots, etc.), heavily disturbed soils, ruderal vegetation, closed-canopy (i.e., lacking openings where food plants might grow) woodlands, riparian, close-canopy chaparral or scrub, and aquatic habitats (i.e., ponds, drainages, etc.). These areas of unsuitable habitat were noted on a set of aerial photographs for Areas I, II, and the extra survey areas after some spot-checking for larval and adult food plants at selected locations to confirm their absence.

We then returned to all portions of Areas I and II that were initially identified as potential habitat for the food plants of the Quino Checkerspot. These included rock outcrops with patches of thin soils, grasslands, and areas of open canopy woodland, scrub, or chaparral. We systematically hiked throughout all such accessible portions of Areas I, II, and the extra survey areas. Due to the steepness of some rock outcrops, for safety reasons we surveyed these areas using binoculars and a spotting scope from various nearby vantage points.

Locations of any observed food plants were mapped with the Trimble GPS units. All positional information was differentially corrected and converted to ArcGIS (version 10) shapefiles.

Photographs of representative habitat conditions were taken at various locations throughout Areas I, II, and the extra survey areas. A Ricoh-GPS camera was utilized to associate each photograph with its location (Figure 4). The identification numbers of the 72 photopoint locations illustrated in Figure 4 match each photo's identification number in Appendix A of this report.

SURVEY RESULTS

Plantago erecta was observed growing at small patches of thin soils situated on north-facing rock outcrops within a localized portion of Area I. These locations are illustrated in Figure 5. Despite our intensive surveys throughout other portions of Areas I and II, as well as the extra survey areas, it was not observed anywhere else. None of the other known larval food plants of the Quino Checkerspot were observed during our habitat assessment survey. The only adult nectar plant observed was Lasthenia sp. It grew in association with some of the Plantago erecta patches.

The total mapped area of *Plantago erecta* measured 15,747 ft.² (0.36 acre). However, the density of plants growing within these locations was extremely low, typically less than 5% of the total vegetative cover within a patch and often less than 1% of the vegetative cover. Thus the overall biomass of *Plantago erecta* was quite small.

Although we were not conducting a presence-absence survey for any life stages of the Quino Checkerspot butterfly, according to the Carlsbad office of the US Fish & Wildlife Service (http://www.fws.gov/carlsbad/TEspecies/Documents/QuinoDocs/QuinoMonRef/Quino_Ref_Info_htm) the timing of our habitat assessment survey coincided with the period when late instar larvae or adults were being observed at other locations known to support the butterfly. However, no life stages of the Quino Checkerspot were seen during our field surveys.

CONCLUSIONS

Existing habitat conditions for the Quino Checkerspot within study sites at Areas I and II, as well as in the extra study areas of the SSFL are of such poor quality that I would not expect the endangered butterfly to occur there at this time. This conclusion is based on the following factors:

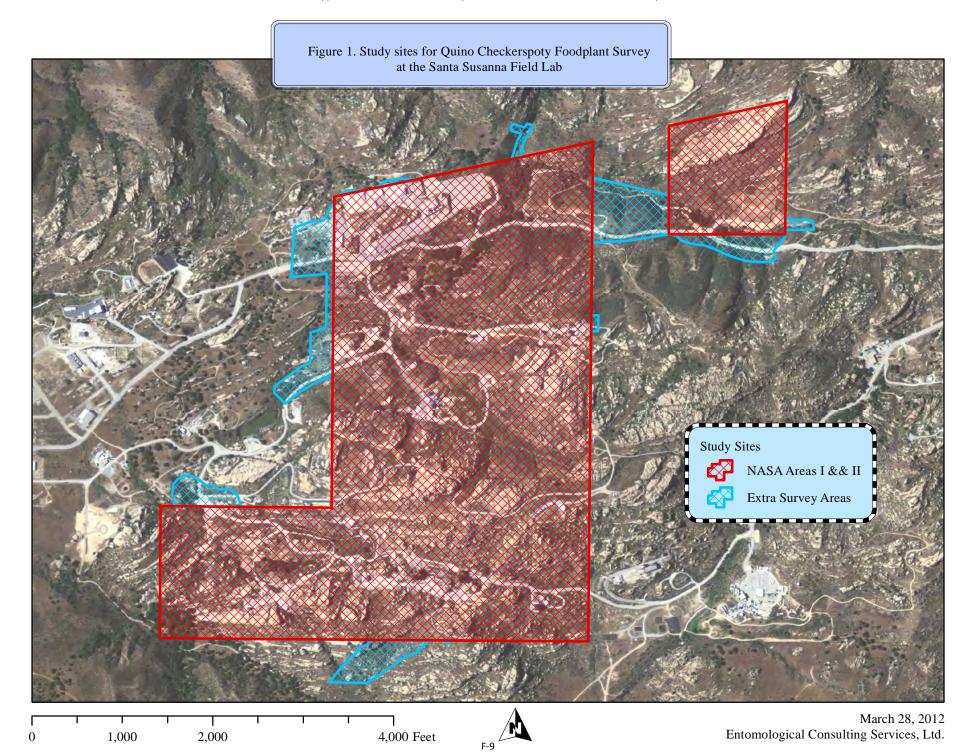
- a) The Quino Checkerspot butterfly is not known to be associated with most of the predominant habitat types that characterize the study areas.
- b) Largely inappropriate conditions characterize those habitat types that occur at SSFL and are known to support food plants of the Quino Checkerspot, primarily due to the lack of open canopies, the prevalence of non-native grasses and forbs in the understory, etc.
- c) Like its relative, the threatened Bay Checkerspot (*Euphydryas editha bayensis*), the Quino Checkerspot has a highly colonial population structure. Populations are generally found where its larval and adult food plants grow in relatively high densities in patches scattered over dozens, if not hundreds of acres. In contrast, within our study area at SSFL, *Plantago erecta* is limited to a total of 0.36 acre, which represents only 0.08% of the entire study area.
- d) Where it does grow, *Plantago erecta* occurs at very low abundance, with densities typically less than 5% of the total herbaceous vegetative cover and often less than 1%.
- e) None of the checkerspot's secondary larval food plants were observed within our study sites.
- f) The only nectar plant observed was *Lasthenia* and it was of very limited abundance, even less than *Plantago erecta*.
- g) Lastly, all observed occurrences of *Plantago erecta* and *Lasthenia* were on rock outcrops, which are not considered suitable habitat for the Quino Checkerspot. The previously cited webpage of the Carlsbad office of the US Fish & Wildlife Service states "there has never been any demonstrated correlation between occupied Quino habitat and rock outcrops, nor have rock outcrops been described in any published Service documents as components or indicators of suitable habitat."

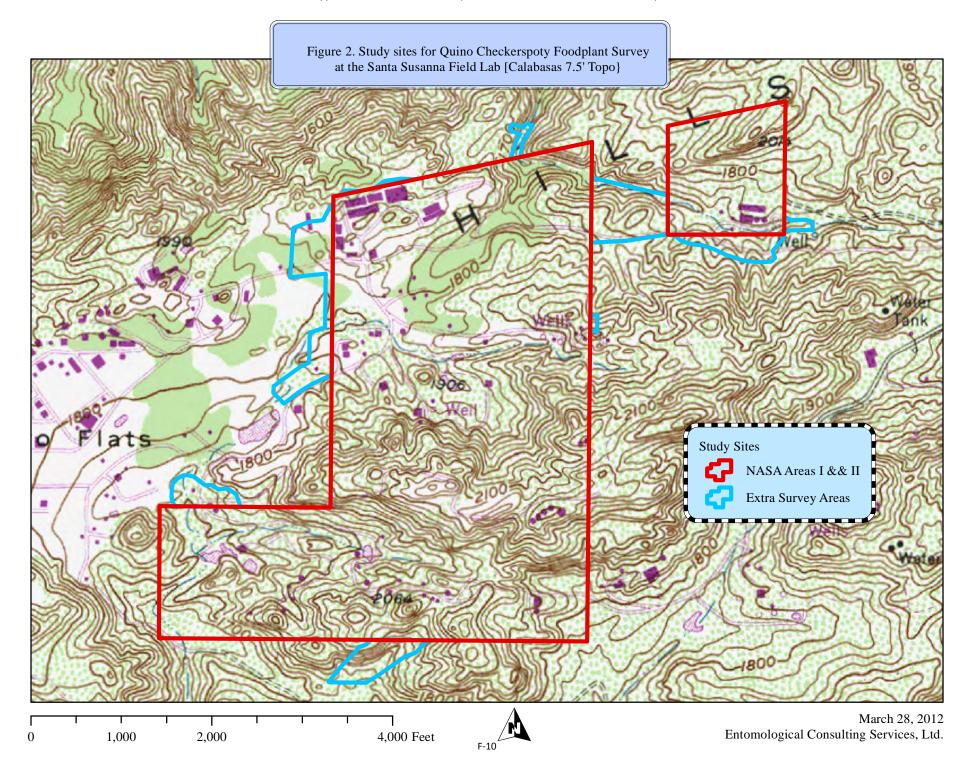
For these reasons, I conclude that the existing habitat conditions within our survey areas at SSFL are unsuitable to support the endangered Quino Checkerspot butterfly and it is extremely unlikely to occur there.

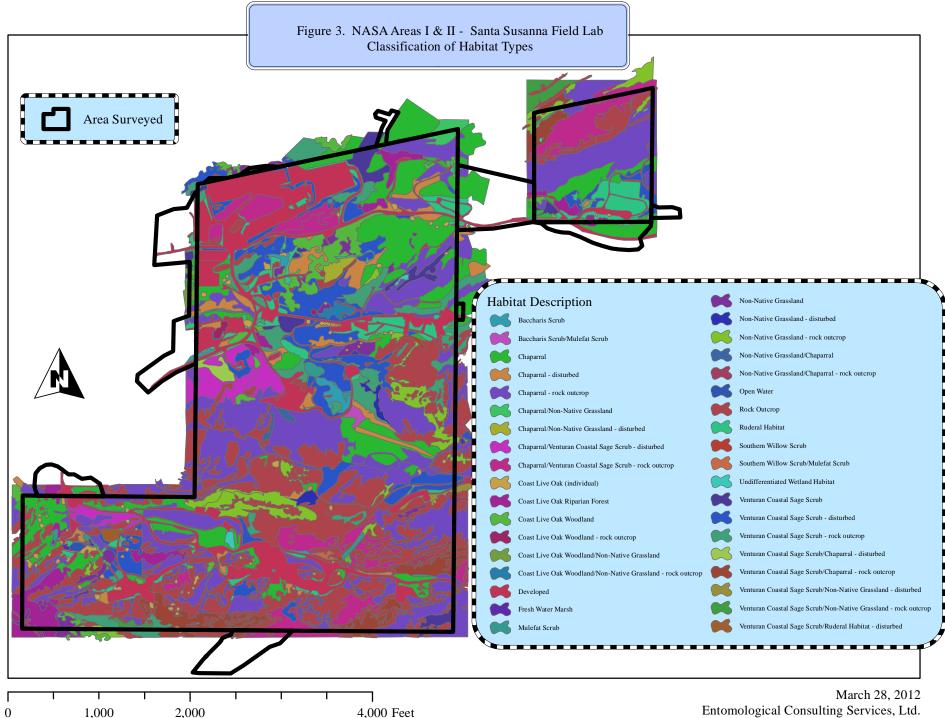
REFERENCES CITED

BUGGY Data Base. 2012. Report of occurrences for the Qunio Checkerspot Butterfly. Data Base maintained by Entomological Consulting Services, Ltd. Pleasant Hill, CA.

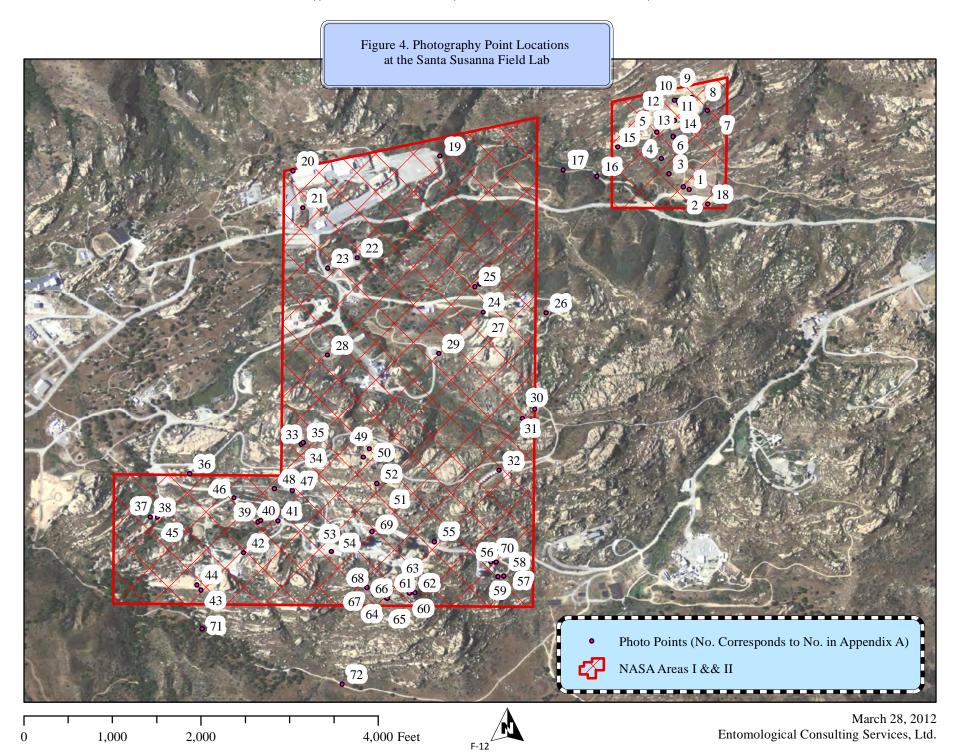
- California Natural Diversity Data Base (CNDDB). 2012. Report of occurrences for the Qunio Checkerspot Butterfly. CNDDB, Rarefind version 3.1.0. California Department of Fish and Game. Sacramento, CA.
- Faulkner, D. 2010. Site Assessment for Quino Checkerspot Butterfly, Santa Susana Field Laboratory Area IV, Ventura County, California. Letter report dated 15 July 2010 and addressed to Thomas W. Mulroy of SAIC. 3 pp. & map.
- NASA. 2011. Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory. Huntsville, AL. Final report.
- Pratt, G.F. and J.F. Emmel. 2010. Sites chosen by diapausing or quiescent stage Quino Checkerspot butterfly, *Euphydryas editha quino*, larvae. Journal of Insect Conservation 14:107-114.
- U.S. Fish & Wildlife Service. 1997. Endangered and threatened wildlife and plants; determination of endangered status for the Laguna Mountains skipper and Bay Checkerspot butterfly. Federal Register 62:2313-2322.
- U.S. Fish & Wildlife Service. 2003. Recovery plan for the Quino Checkerspot Butterfly. Portland, OR. 191 pp.
- U.S. Fish & Wildlife Service. 2009. Revised designation of critical habitat for the Quino Chekcerspot butterfly (*Euphydryas editha quino*). Federal Register 74:28776-28862.

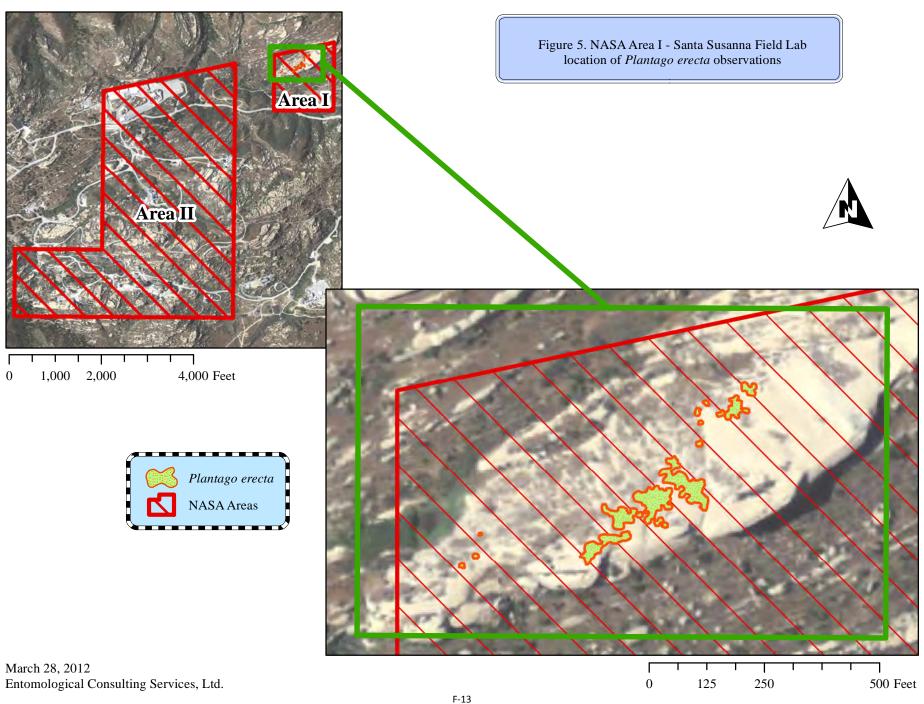






F-11





Appendix F, NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Appendix A

Photodocumentation of

Santa Susanna Field Lab

NASA Areas I & II



Photo Point 1



Photo Point 2



Photo Point 3



Photo Point 4



Photo Point 5



Photo Point 6



Photo Point 7



Photo Point 8



Photo Point 9



Photo Point 17

Photo Point 16

Photo Point 18



Photo Point 19



Photo Point 20



Photo Point 21



Photo Point 22



Photo Point 23



Photo Point 24

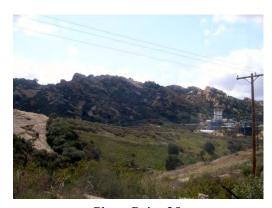


Photo Point 25



Photo Point 26



Photo Point 27



Photo Point 28



Photo Point 29



Photo Point 30

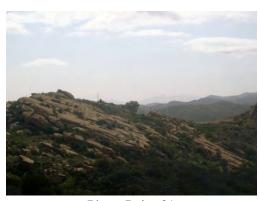


Photo Point 31



Photo Point 32



Photo Point 33



Photo Point 34



Photo Point 35



Photo Point 36



Photo Point 37



Photo Point 38



Photo Point 39



Photo Point 40



Photo Point 41



Photo Point 42

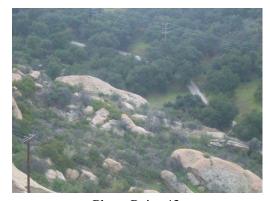


Photo Point 43



Photo Point 44



Photo Point 45



Photo Point 46



Photo Point 47



Photo Point 48



Photo Point 49



Photo Point 50



Photo Point 51



Photo Point 52



Photo Point 53



Photo Point 54



Photo Point 55



Photo Point 56



Photo Point 57



Photo Point 58



Photo Point 59



Photo Point 60



Photo Point 61



Photo Point 62



Photo Point 63

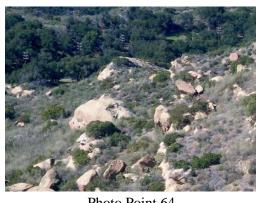


Photo Point 64



Photo Point 65



Photo Point 66



Photo Point 67



Photo Point 68



Photo Point 69



Photo Point 70



Photo Point 71



Photo Point 72

End of Appendix F